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(54) Title: USE OF DAMMARANE-TYPE TRITEPENOID SAPORINS

(57) Abstract: The present invention discloses the use of a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof for treating or preventing conditions, which are related to reduced nitric oxide levels, or which are ameliorable or preventable by augmentation of nitric oxide levels, within the human body, or for promoting responses requiring enhanced nitric oxide levels within the human body.

USE OF DAMMARANE-TYPE TRITEPENOID SAPORINS

FIELD OF THE INVENTION

THIS INVENTION relates generally to agents useful in the preparation of pharmaceutical compositions for preservation of good health and amelioration of various conditions affecting humans. More particularly, the present invention relates to pharmaceutical compositions comprising a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof for treating or preventing conditions, which are related to reduced nitric oxide levels, or which are ameliorable or preventable by augmentation of nitric oxide levels, within the human body, or for promoting responses requiring enhanced nitric oxide levels within the human body.

BACKGROUND OF THE INVENTION

Bacopa monnieri L (Syn: *Herpestis monnieri* L., HB & K), Brahmi has been used for many years as a potent nerve tonic in the traditional Indian system of medicine (Chopra *et al*, 1956, *In: Glossary of Indian Medicinal Plants, Council of Scientific and Industrial Research, New Delhi*, page 32). Various extracts of this perennial creeping plant have been used to enhance memory retention and to treat epilepsy and insomnia (Pandey *et al* 1967, *Bhav Prakasah Nighantu,* page 461). Traditional Indian preparations of *Bacopa monnieri* have also been used for treating anxiety, stress, constipation, small boils and diabetes.

The activity associated with memory retention has been localised to the saponin-containing fraction of this plant (Chatterjee *et al.*, 1963, *Indian Journal of Chemistry* **1**: 212; Singh *et al.*, 1988, *Phytother. Res.* **2**: 70). The active saponin constituents have been designated bacopasaponins A, B, C, D, E and F (Chatterjee *et al.*, 1965, *Indian J. Chemistry* **3**: 24; Chatterjee *et al.*, 1963, *Indian J. Chemistry* **1**: 212; Basu *et al.*, 1967, *Indian J. Chemistry* **5**: 84; Rastogi *et al.*, 1994, *Phytochemistry* **36**: 133-137; Garai *et al.*, 1996, *Phytochemistry* **42**: 815-820; Garai *et al.*, 1996, *Phytochemistry* **43**: 447-449; Mahato *et al.*, 2000, *Phytochemistry* **53**(6): 711-714). Acid hydrolysis of the active saponin–containing fraction yields a mixture of aglycones, bacogenin A_1 (Kulshreshtha *et al.*, 1973, *Phytochemistry* **12**: 887; Kawai *et al.*, 1973, *Acta Cryst* **829**: 2947), bacogenin

A_2 (Kulshreshtha *et al.*, 1974, *Phytochemistry* **12:** 1205), bacogenin A_3 (Chandel *et al.*, 1997, *Phytochemistry* **16:** 141) and bacogenin A_4 (Kulshreshtha *et al.*, 1973, *Phytochemistry* **12:** 2074).

In work leading up to the present invention, it was unexpectedly discovered that one or more saponins, particularly bacopasaponins including their analogues and derivatives, enhance the production of nitric oxide within the human body. Nitric oxide is an important physiological regulator of functions such as vasodilation and neurotransmission. In the body, nitric oxide is generated from L-arginine by nitric oxide synthases (NOSs) that are differentially induced by cell-specific (endothelium, neutrophils, adrenal tissue, cerebellum) cofactors such as Ca^{2+}-dependent calmodulin, tumour necrosis factor, and other cytokines (Ignarro, L.J., 1990, *Hypertension* **16**: 477–483; Moncada, S., 1999, *J. R. Soc. Med.* **92**: 164–169.). There are three isoforms of this enzyme: type I (neuronal nitric oxide synthase, nNOS; NOS-1), type II (inducible nitric oxide synthase, iNOS; NOS-2), and type III (endothelial nitric oxide synthase, eNOS; NOS-3). Type I and III are usually constitutively present in the cell (cNOS); however, under certain conditions, their expression can also be induced. These isoenzymes are activated by an increase in intracellular calcium, which facilitates the binding of calmodulin to NOS, thus activating the enzyme (Stuehr *et al.*, 1995, *Adv. Pharmacol.***34**: 207-213). The second class of NOS, the so-called "inducible" form, is expressed in cells after exposure to certain cytokines; however, some tissues express this isoform of NOS even under basal conditions. The major difference between the "constitutive" and "inducible" isoforms is the amount and duration of nitric oxide produced by either NOS. All three isoforms have similar specific activities when purified to homogeneity; however, the total amount of nitric oxide generated per cell by cNOS is low as compared to that generated by iNOS. The flux of nitric oxide generated by cNOS is of short duration, while iNOS generates considerably higher concentrations of nitric oxide for periods of hours to days. Therefore, physiological versus potentially toxic actions of nitric oxide might be dictated by the presence and activity of specific isoforms of NOS.

It appears that the main function of nitric oxide as cell messenger is to stimulate cell guanylate cyclase to elevate cyclic guanosine monophosphate, which in turn activates smooth muscle relaxation, platelet stability, and neurochemical potentiation (Moncada *et al.*, 1993, *New Engl. J. Med.* **329**: 2002-2012; Schmidt *et al.*, 1994, *Cell* **78**: 919-925).

Nitric oxide reacts strongly in biological systems with other metal-proteins and thiols, as well as with molecular oxygen and superoxide free radical (Stamler *et al.*, 1994, *Cell* **78**: 931-936). It also serves as a free radical scavenger by rapidly reacting with free radicals involved in lipid peroxidation and perhaps in aged-related modifications of proteins (Kanner *et al.*, 1992, *Lipids* **27**: 46-49; Stadtman, 1988, *Gerontol.* **43**: B112-B120). In tissues, generated nitric oxide seems normally to be an anti-oxidant (Kanner *et al.*, 1991, *Biochem. Biophys.* **289**: 130-136). Consistent with these properties, it has been suggested that enhancement of nitric oxide levels can promote greater local scavenging of reactive oxygen species during oxidative stress in ischaemic injury, diabetes mellitus, and aging (Waugh, W.H., US Patent No. 6,028,907).

Nitric oxide has been used therapeutically to treat certain diseases characterised by nitric oxide insufficiency, including hypertension, angina and male sexual dysfunction. There is evidence that the endogenous production of nitric oxide via the L-arginine-nitric oxide pathway is defective in patients with hypertension and possibly angina. Nitric oxide has been used to treat angina for over 100 years in the form of nitroglycerine and, in this regard, it has recently been shown that the release of nitric oxide by nitroglycerine in the vascular wall is responsible for its activity.

Augmentation of vascular nitric oxide levels has been suggested as a therapeutic strategy for the prevention and/or amelioration of vascular degenerative diseases (*e.g.*, atherogenesis, restenosis, transient ischaemic attack, ischaemic stroke, and lacunar infarction; coronary artery and peripheral atherosclerotic disease; coronary artery and peripheral angiospastic disease and the like) and for the attenuation of neointimal formation after endothelial injury (Lloyd-Jones *et al.*, 1996, *Annu. Rev. Med.* **47**: 367-375, Cooke *et al.* in US Patent No 5,945,452). In this regard, it has been shown that nitric oxide is important for vascular integrity and for the prevention of atherosclerotic lesions by promoting vasodilation (Palmer *et al.*, 1987, *Nature* **327**: 524-526; Ignarro *et al.*, 1987, *Proc. Natl. Acad. Sci. USA* **84**: 9265-9269), inhibiting platelet adherence and aggregation (Radomski *et al.*, 1987, *Br. J. Pharmocol.* **92**: 639-646), inhibiting vascular smooth muscle (Nunokawa *et al.*, 1992, *Biochem. Biophys. Res. Com.* **188**: 409-415) and fibroblast (Werner-Felmayer *et al.*, 1990, *J. Exp. Med.* **172**: 1599-1607) cellular proliferation. Cardiovascular risk factors, including hypercholesterolemia, hypertension, diabetes and smoking as well as established cardiovascular disease, are associated with impairment of

various nitric oxide systems, which may contribute to limitations in exercise capacity through inadequate or peripheral blood delivery and via metabolic effects. Exercise training in individuals with elevated cardiovascular risk or established disease can increase nitric oxide bioavailability and may represent an important mechanism by which exercise training provides benefit in the setting of secondary prevention (Kingwell, BA, 2000, *Clin. Exp. Pharmocol. Physiol.* **27**(4): 239-250; Lewis *et al.*, 1999, *Arterioscler. Thromb. Vasc. Biol.* **19**(11): 2782-2787). Enhancement of nitric oxide bioavailability may, therefore, have clinical potential in treating and/or preventing cardiovascular disease and reducing blood pressure.

Studies by Taylor *et al.* (1998, *Biochemistry (Mosc)* **63**(7): 766-781), investigating the effects of nitric oxide in the liver, demonstrate that induced nitric oxide synthesis plays an important role in hepatocyte function and protects the liver during sepsis and ischaemia reperfusion. Addition of nonspecific NOS inhibitors significantly increases hepatic damage. Nitric oxide exerts a protective effect through its ability to prevent intravascular thrombosis by inhibiting platelet adhesion and neutralising toxic oxygen radicals. Nitric oxide also exerts protective effects both *in vivo* and *in vitro* by blocking TNF-α-induced apoptosis and hepatotoxicity, in part by a thiol-dependent inhibition of caspase-3-like protease activity. These studies demonstrate the cytoprotective effects of nitric oxide in the liver and suggest hepatic iNOS expression functions as an adaptive response to minimise inflammatory injury. Enhancement of hepatic nitric oxide levels may, therefore, be beneficial in protecting the liver during sepsis and ischaemia reperfusion and in minimising inflammatory injury.

Basal whole body nitric oxide production has been shown by Wever *et al.* (1999, *Arterioscler. Thromb. Vasc. Biol.* **19**(5): 1168-1172) to be reduced in patients with chronic renal failure. These investigators proposed improving of nitric oxide production as a therapeutic intervention to endothelial dysfunction in patients afflicted with chronic renal failure.

It has been shown that nitric oxide participates in the tumoricidal activity of macrophages (Hibbs *et al.*, 1987, *J. Immunol.* **138**: 550-565) and that large amounts of nitric oxide derived from iNOS expressed in other cell types such as Kupffer cells, natural killer cells (NK), microglial and endothelial cells participates in the tumoricidal activity

against many types of tumours (Yim *et al.*, 1995, *J. Immunol.* **155**: 4382-4390; Kurose *et al.*, 1993, *Cancer Res.* **53**: 2676-2682; Fukumura, *et al.*, 1996, *Hepatology* **24**: 141-149; Curley *et al.*, 1993, *J. Leukoc. Biol.* **53**: 715-721; Jiang *et al.*, 1992, *J. Immunol.* **149**: 2137-2146; Leu *et al.*, 1991, *J. Immunol.* **147**: 1816-1822). The combined findings of these cell culture experiments imply that nitric oxide has a cytostatic or cytotoxic effect on tumour cells. *In vivo* studies suggest that nitric oxide plays an important role in the control of tumour growth. Macrophages harvested from tumour-bearing animals exhibit reduced capacity to produce nitric oxide as well as diminished tumoricidal activity (Gardner *et al.*, 1995, *J. Surg. Res.* **59**: 305-310; Lejeune *et al.*, 1994, *J. Immunol.* **152**: 5077-5083; Dinapoli *et al.*, 1996, *J. Exp. Med.* **183**: 1323-1329). Studies have shown that tumour-bearing patients have elevated levels of IL-10 and TGF-*beta*1 (Alleva *et al.*, 1994, *J. Immunol.* **153**: 1674-1686; Vodovotz, Y., 1997, *Nitric Oxide: Biol. Chem.* **1**: 3-17; Maeda *et al.*, 1995, *J. Immunol.* **155**: 4926-4932) supporting the notion that there is a relationship between these suppressive factors, reduction of nitric oxide production, and tumour burden. In addition to these agents, other agents such as phosphatidylserine secreted from mammary tumours also decrease NOS activity in leucocytes (Calderon *et al.*, 1994, *J. Exp. Med.* **180**: 945-958). The relationship between reduction of nitric oxide and increased tumour burden indicates that the presence of this free radical is an integral part of the antitumour response of the immune system. The generation of high levels of nitric oxide *in vivo* by the nitric oxide donor sodium nitroprusside (SNP) and by lipopolysaccharide (LPS) has been shown to reduce pancreatic tumour growth, which suggests that high level nitric oxide generation, with potential production of endogenous reactive nitrogen intermediates, may contribute to the induction of apoptosis and tumour growth inhibition (Hajri *et al.*, 1998, *Br. J. Cancer* **78**(7): 841-849). Nitric oxide generating agents, S-nitroso-N-acetyl-penicillamine (SNAP) or SNP, have been shown *in vitro* by Kurimoto *et al.* (1999, *J Neurooncol* **42**(1): 35-44) to inhibit the growth of, and to radiosensitize glioma cells. Nitric oxide has also been found to reduce gastric carcinoma metastasis (Zhao *et al.*, 1998, *World Journal of Gastroenterology* **10**: 4-10).

Nitric oxide has also been shown to exert beneficial effects, by acting as an anti-bacterial, anti-parasitic, or as an anti-viral agent (*e.g.*, anti-HIV agent) (*e.g.* Colasanti & Suzuki, 2000, *Trends Pharmocol. Sci.* **21**(7): 249-252; Wallace & Miller, 2000, *Gastroenterology* **119**(2) 512-520); Pfaff *et al.*, 2000, *Parasite Immunol.* **22**(8): 397-405;

Venturini *et al.*, 2000, *Biochem Biophys Res Commun.* **267**(1): 190-193; Sherry *et al.*, 2000, *Mol. Med.* 6(6): 542-549; Pinelli *et al.*, 2000, *Vet. Parasitol.* **92**(3): 181-189; Nappi *et al.*, 2000, *Nitric Oxide* 4(4): 423-430; Shinde *et al.*, 2000, *Indian J Exp Biol* **38**(3): 201-210; Gobert *et al.*, *Infect. Immun.* **68**(8): 4653-4657; Taylor-Robinson, 2000, *Med. Hypotheses* **54**(4): 638-641; Kuritomo *et al.* 1999, *J. Neurooncol.* **42**(1): 35-44; Perichini *et al.*, 1999, *Int. J. Mol. Med.* 4(4): 365-368; *ibid, Biophys. Biochem. Res. Commun.* **258**(3): 624-627; Sehajpal *et al.*, 1999, *Biochemistry* **38**(40):13407-13413; Mannick *et al.*, 1999, *J. Acquir. Immune Defic. Syndr.* **22**(1): 1-9). It has also been shown to be useful in treating sickle cell disease (Space *et al.*, 2000, *Am J Hematol* **63**(4): 200-204; Sullivan *et al.*, 1999, *Crit Care Med* **27**(11): 2563-2568; Nagel, R.L., 1999, *J Clin Invest* **104**(7): 847-848); and Head *et al.*, 1997, *J Clin Invest* **100**(5): 1193-1198) and in wound healing (Carter *et al.*, 1994, *Biochem J.* **304**: 201-204; see also Shabani *et al.*, 1996, *Wound Healing Repair and Regeneration* 4(3): 353-362; and Billiar *et al.* in US Patent No. 6,103,230).

It also appears that endogenous production of nitric oxide is important for relaxing smooth muscle tone during pregnancy. Basal release of nitric oxide in human umbilical arteries and veins appears to be important in normal pregnancies and deliveries (Chaudhuri *et al.*, 1993, *Am. J. Physiol.* **265**: 2036H-2043H). Inhibition of constitutive nitric oxide synthase activity during the latter part of pregnancy produces a preeclampsia-like syndrome and retardation of foetal growth in rats (Molnar *et al.*, 1994, *Am. J. Obst. Gynecol.* **170**: 1458-1466). Some evidence suggests that preeclampsia and eclampsia are diseases, typified by vasoconstriction, which are endothelial cell disorders with endothelial injury involving the fetoplacental vessels (Roberts *et al.*, 1989, *J. Obstet. Gynecol.* **161**: 1200-1204). Accordingly, it has been suggested that augmentation of nitric oxide levels may be used as a therapeutic strategy for enhancing relaxation of smooth muscle tone during normal pregnancy and for treating or preventing conditions such as preeclampsia, spontaneous preterm labour and the like (Waugh, W.H., *supra*).

Nitric oxide has also been found to play a role in the secretion of human breast milk (Iizuka *et al.*, 1998, *Pediatr. Res.* 44(2): 197-200) and may thus have utility in enhancing lactation *post partum*.

Hormone replacement therapy has been shown to decrease the oxidative stress level and to increase the nitric oxide derivative metabolites in menopausal women with and

without hot flushes (Hernandez *et al.* 2000, *Med. Clin. (Barc)* **114**(2): 41-45). Enhancement of nitric oxide levels may, therefore, have clinical potential in treating or preventing symptoms associated with menopause.

Oligemic vasoconstriction that follows induced cortical spreading depression in rats is reduced by L-arginine induced production of nitric oxide and raises the possibility that low nitric oxide levels contribute to reduced cerebral blood flow in migraine patients Fabricius *et al.*, 1995, *Am. J. Physiol.* **269**: H23-H29; Lauritzen, 1996, *Sci. Med.* **3**: 32-41). Increasing nitric oxide levels has, therefore, been postulated as being useful for treating migraine and migraine syndrome. Consistent with this hypothesis, it has been shown that inhalation of small amounts of amyl nitrite, a well-known donor of nitric oxide, temporarily reversed migraine aura in some cases (Silberstein *et al.*, p. 115 in: Wolff's Headache and Other Head Pain, 6th ed., 1993).

The promotion of vascular nitric oxide production by intake of arginine, potassium, sex hormone replacement, anti-oxidants and fish oils has also been suggested as a therapeutic strategy for Alzheimer's disease (McCarty, M.F., 1998, *Med. Hypotheses* **51**(6): 465-476; *ibid*, 1999, *Med. Hypotheses* **53**(6): 369-476-374).

Although a variety of studies has shown that nitric oxide is proinflammatory, there is a conflicting notion that nitric oxide may be protective during an inflammatory insult. In this regard, Paul-Clark *et al* (2001, *J Immunol* **166**(2): 1169-1177) have shown recently that local production of nitric oxide protects against inflammation by virtue of its ability to regulate the release of typical proinflammatory mediators and, importantly, that NOS inhibitors have differential anti-inflammatory effects depending on their route of administration. Accordingly, enhancement of nitric oxide levels may have clinical potential in treating or preventing inflammation associated conditions.

Nitric oxide has also been shown to activate telomerase and to delay cell senescence (Vasa *et al.*, 2000, *Circ Res* **87**(7): 540-542). Telomerase is an enzyme that adds telomeric-repeated sequences to the ends of human chromosome DNA. Human telomeres undergo progressive shortening with cell division, and critical shortening of telomeres with cellular aging triggers a signal for cells to stop dividing and senesce. Thus,

the promotion of nitric oxide has been suggested as a strategy for inhibiting senescence mechanisms to thereby extend the lifespan of cells and entire organisms.

Increased nitric oxide synthase activity and enhanced apoptosis are features of gastric mucosa infected with *Helicobacter pylori* and a causative relation has been suggested. However, although nitric oxide can promote apoptosis, its actions vary with cell type and in this regard, Potter *et al.* (2000, *Gut* 46(2): 156-162) have found recently that exogenous nitric oxide inhibits apoptosis in gastric mucosal cells and it may counter the proapoptotic effects of this *H. pylori*.

Nitric oxide has also shown to be essential for maximal ovulation and a lack of nitric oxide during the periovulatory period results in severe defects in oocyte maturation (Jablonka-Shariff *et al.*, 1999, *J. Soc. Gynecol. Investig.* 6(2): 95-101) and may contribute to female infertility (Klein *et al.*, 1998, *Mol. Med.* 4(10): 658-664). There is also evidence showing a correlation between sporadic limb reduction defects and abrogation of normal nitric oxide production in endothelial cells. Early postnatal mitochondrial maturation in the brain has also been shown to be a nitric oxide-mediated process (Almeida *et al.*, 1999, *FEBS Lett* 452(3): 290-294). Accordingly, exogenous nitric oxide may be useful in promoting normal oocyte maturation, in reducing the incidence of congenital defects and/or in enhancing female fertility.

Treatment of semen samples obtained from fertile and asthenozoospermic infertile patients with SNP-generated nitric oxide has revealed that it is beneficial to sperm viability and motility in both fertile and infertile individuals, and that reduction of lipid peroxidative damage to sperm membranes and increase of intracellular cGMP may be involved in these benefits (Zhang *et al.*, 1996, *Free Radic. Res.* 25(4): 347-354). Increasing nitric oxide levels may therefore also represent a therapeutic strategy for male infertility.

Despite evidence that nitric oxide contributes to the pathogenesis of osteoporosis in the presence of proinflammatory cytokines, several studies have shown that in the absence of inflammatory disease, high nitric oxide levels can inhibit osteoclast-mediated bone resorption and promote bone formation *in vivo* and *in vitro*. Conversely, it has been found that decreased nitric oxide production potentiates osteoclast-mediated bone resorption *in vitro* and is associated with *in vivo* bone loss in rats and humans (Collin-

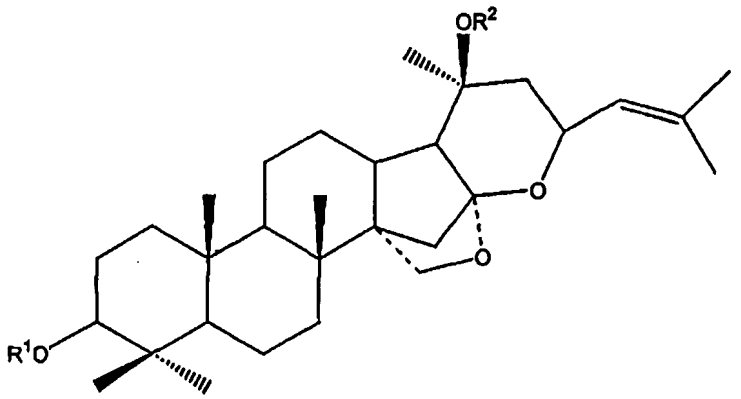
Osdoby *et al.*, 1998, *J Bone Miner Res* 13(1): 67-78; *ibid*, 2000, *J Bone Miner Res* 15(3): 474-488). For example, it has been shown that nitroglycerine prevents ovariectomy-induced bone loss, counteracts prednisolone-induced bone loss, and restores ovariectomy-induced osteopenia (Wimalawansa *et al.*, 1996, *Bone* 18(4): 301-304; *ibid*, 1997, *Bone* 21(3): 275-280; Wimalawansa, S.J., 2000, *Calcif. Tissue Int.* 66(1): 56-60). It has also been found that intermittent administration of nitrates to postmenopausal women can protect against estrogen-deficient bone loss and enhance bone mineral density (Jamal *et al.*, 1998, *J. Bone Miner. Res.* 13(11): 1755-1759) .

Having regard to the various beneficial effects produced either directly or indirectly by nitric oxide, and to various other unexpected properties of the bacosaponin compounds described herein, the present discoveries have been reduced to practice in novel pharmaceutical compositions and methods as described hereinafter.

SUMMARY OF THE INVENTION

Accordingly, in one aspect of the present invention, there is provided a pharmaceutical composition for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by enhanced nitric oxide levels, within the human body, or for promoting a response requiring enhanced nitric oxide levels within the human body, said composition comprising a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these and optionally a pharmaceutically acceptable carrier and/or diluent.

Suitably, the dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside. In a preferred embodiment, the dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



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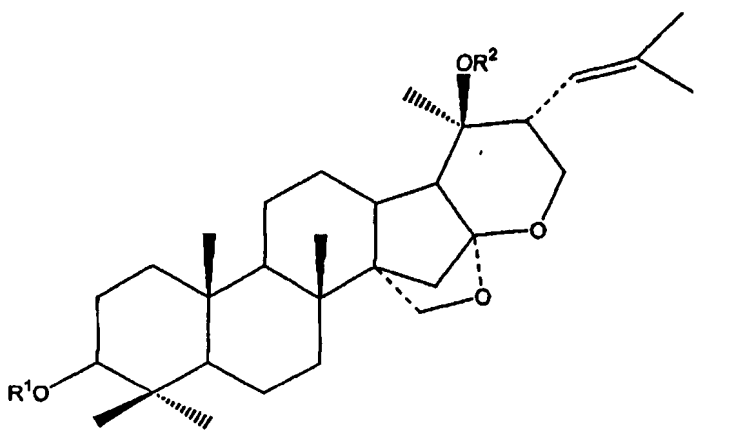

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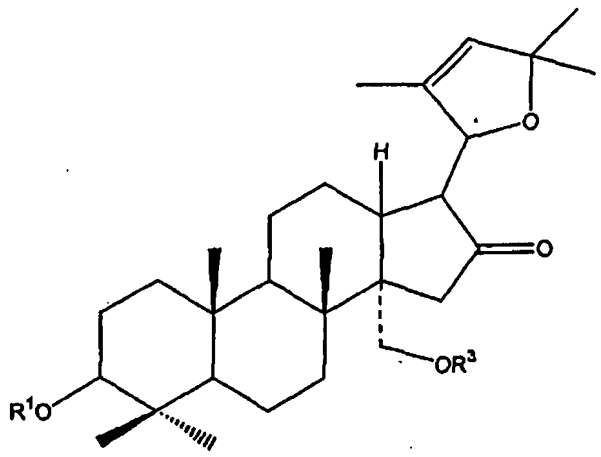

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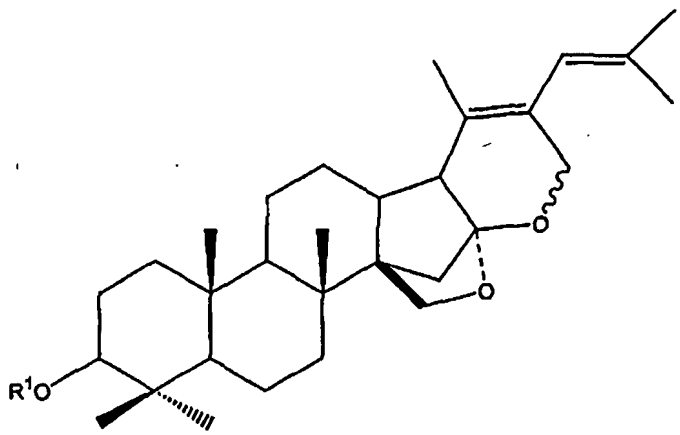

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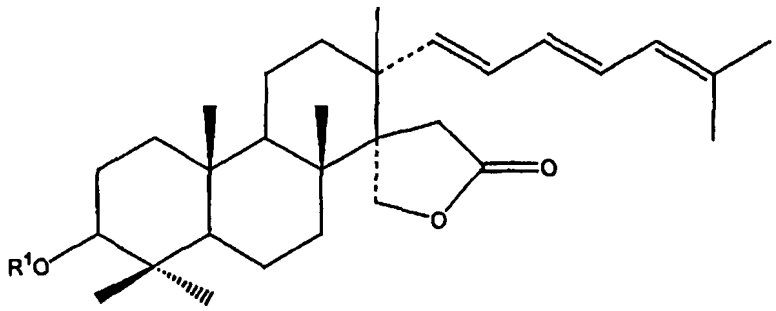


wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising

at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

In a preferred embodiment, the compound is selected from bacopasaponin A, bacopasaponin B, bacopasaponin C and bacopasaponin D, bacopasaponin E, bacopasaponin F, or analog or derivative thereof.

Suitably, the compound is derived from a plant of the genus *Bacopa*. Preferably, said plant is *Bacopa monnieri* (Brahmi).

In a preferred embodiment, the compound is provided in the form of a saponin-containing extract or fraction of a plant of the genus *Bacopa*.

Preferably, the saponin-containing extract or fraction comprises at least one bacopasaponin selected from the group consisting of bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analog or derivative thereof.

In another aspect, the invention resides in a pharmaceutical composition for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by enhanced nitric oxide levels, within the human body, or for promoting a response requiring enhanced nitric oxide levels within the human

body, said composition comprising a saponin-containing extract or fraction of a plant of the genus *Bacopa* and optionally a pharmaceutically acceptable carrier and/or diluent.

In yet another aspect, the invention resides in a method for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by enhanced nitric oxide levels, in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to treat or prevent said condition.

In a further aspect, the invention provides a method for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by enhanced nitric oxide levels, in a patient, said method comprising administering to said patient an effective amount of a saponin-containing extract or fraction of a plant of the genus *Bacopa* and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to treat or prevent said condition.

In a preferred embodiment, the condition is Alzheimer's disease.

In another preferred embodiment, the condition is a vascular associated condition (*e.g.*, a vascular degenerative disease).

In another preferred embodiment, the condition is inflammation.

In another preferred embodiment, the condition is a cancer or tumour.

In an alternate embodiment, the condition is suitably a kidney disorder (*e.g.*, nephritis, renal calculus associated nephritis, etc).

In another embodiment, the condition is involuntary muscle movement or muscle cramp.

In a further preferred embodiment, the condition is a pathogenic infection.

In a further aspect, the invention contemplates a method for promoting in a patient a response requiring enhanced or elevated nitric oxide levels, said method comprising

administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to promote said condition.

In another aspect, the invention resides in a method for promoting in a patient a response requiring enhanced or elevated nitric oxide levels, said method comprising administering to said patient an effective amount of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to promote said condition.

In a preferred embodiment, the response is vasodilation.

In another preferred embodiment, the response is reduced blood pressure.

In another preferred embodiment, the response is reduced amyloid β peptide production.

In another preferred embodiment, the response is increased bone formation.

In another preferred embodiment, the response is reduced osteoclastic bone resorption.

In another preferred embodiment, the response is increased or continuing brain or neural activities.

In yet another preferred embodiment, the response is enhanced wound healing.

In a further preferred embodiment, the response is enhanced neuronal growth.

In still yet another preferred embodiment, the response is enhanced or augmented immunity.

In yet another preferred embodiment, the response is increased anti-oxidant levels.

In yet another preferred embodiment, the response is reduced oxidative stress levels.

In another preferred embodiment, the response is enhanced lactation.

In another preferred embodiment, the response is improved nutritional quality (*e.g.*, enhanced vitamin content) of breast milk.

In another preferred embodiment, the response is improved fertility.

In another preferred embodiment, the response is inhibition of tumorigenesis.

In a further preferred embodiment, the response is increased telomerase activity.

In yet another preferred embodiment, the response is enhanced hepatic cytoprotection or amelioration of liver damage.

In another preferred embodiment, the response is improved health or maintenance of well being.

In yet another preferred embodiment, the response is weight loss.

In yet another aspect, the invention encompasses a method for enhancing or otherwise promoting vasodilation in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance or promote vasodilation.

In still yet another aspect, the invention contemplates a method for reducing or otherwise inhibiting amyloid β peptide production in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to reduce or inhibit said production.

According to another aspect, the invention provides a method for enhancing or otherwise promoting neuronal growth in a patient, said method comprising administering

to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance or promote said growth.

In another aspect, the invention provides a method for preventing or otherwise inhibiting infection of a patient by a pathogenic organism, said method comprising administering to said patient an infection inhibiting effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent.

In yet another aspect, the invention encompasses a method for preventing or otherwise inhibiting tumorigenesis in a patient, said method comprising administering to said patient a tumorigenesis inhibiting effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent.

In a further aspect, the invention provides a method for enhancing the immune response of a patient against infection by a pathogenic organism, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance the immune response against said pathogenic organism.

In another aspect, the invention provides a method for enhancing the immune response of a patient against a cancer, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a

pharmaceutically acceptable carrier and/or diluent sufficient to enhance the immune response against said cancer.

In still yet another aspect, the invention features a method for reducing or otherwise inhibiting the rate of ageing of a patient, said method comprising administering to said patient an ageing-inhibiting effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent.

In a further aspect, the invention resides in a method for increasing telomerase activity in a cell, said method comprising contacting said cell with a telomerase activity increasing effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent.

In still yet another aspect, the invention features a method for improving the health or maintaining the well-being of a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier or diluent, sufficient to improve said health or to maintain said well-being.

According to another aspect, the invention provides a method of enhancing lactation in a female patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier or diluent, sufficient to enhance lactation.

In yet another aspect, the invention features a method for enhancing bone formation in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative

or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier or diluent, sufficient to enhance said bone formation.

In still yet another aspect, the invention contemplates a method for reducing or otherwise inhibiting osteoclastic bone resorption, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to reduce said resorption.

In another aspect, the invention provides a method for enhancing the rate of wound healing, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance the rate of wound healing.

According to another aspect, the invention encompasses a method for improving male fertility, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to improve said fertility.

In yet another aspect, the invention resides in a method for improving female fertility, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to improve said fertility.

According to another aspect, the invention provides a method for enhancing

hepatic cytoprotection or ameliorating liver damage, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance said cytoprotection or to ameliorate said damage.

In another aspect, the invention envisions a method of improving the quality of human breast milk, comprising administering to a subject *post partum* a milk quality improving effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa*, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to improve said quality .

In a preferred embodiment, the improvement in the breast milk relates to an increase in the protein content of said milk. In another embodiment, the improvement in the milk relates to an increase in the vitamin content of said milk, wherein the vitamin is selected from Vitamins A, D or E or combination of these. In a preferred embodiment, the vitamin is selected from Vitamins A or D.

According to yet another aspect, the invention contemplates use of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, or of a saponin-containing extract or fraction of a plant of the genus *Bacopa,* in the preparation of compositions: for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by enhanced nitric oxide levels; or for promoting a response requiring enhanced nitric oxide levels; or for treating or preventing Alzheimer's disease; or for treating or preventing a vascular associated condition; or for treating or preventing a cancer or tumour; or for treating or preventing a kidney disorder; or for treating or preventing inflammation; or for inhibiting infection by a pathogenic organism; or for inhibiting ageing; or for promoting vasodilation; or for reducing blood pressure; or for reducing or otherwise inhibiting amyloid β peptide production; or for enhancing bone formation; or for reducing or otherwise inhibiting osteoclastic bone resorption; or for

increasing or continuing brain and neural activities; or for promoting wound healing; or for promoting neuronal growth; or for inhibiting tumorigenesis; or for enhancing the immune response (*e.g.*, against infection by a pathogenic organism or against a cancer or tumour); or for enhancing lactation; or for improving fertility; or for increasing telomerase activity; or for promoting weight loss; or for enhancing hepatic cytoprotection or for ameliorating liver damage; or for improving health or maintaining well being of a patient.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a representation showing four isometric strain gauge tracings of aortic rings contracted with phenylephrine and the bacopasaponin solution and treated as follows: A, control; B, LNMMA; C, ODQ; D, haemoglobin.

Figure 2 is a photographic representation of control neuroblastoma cells after seeding.

Figure 3 is a photographic representation showing neuroblastoma cells treated with 1 μg/mL bacopasaponins for 48 hours.

Figure 4 is a photographic representation showing neuroblastoma cells treated with 100 μg/mL bacopasaponins for 48 hours.

Figure 5 is a photographic representation showing neuroblastoma cells treated with 200 μg/mL bacopasaponins for 48 hours.

DETAILED DESCRIPTION OF THE INVENTION

1. Definitions

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by those of ordinary skill in the art to which the invention belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, preferred methods and materials are described. For the purposes of the present invention, the following terms are defined below.

The articles *"a"* and *"an"* are used herein to refer to one or to more than one (i.e. to at least one) of the grammatical object of the article. By way of example, "an element" means one element or more than one element.

The term *"about"* is used herein to refer to the amount, weight or concentration of an active or substance that vary by as much as 30%, preferably by as much as 20%, and more preferably by as much as 10% to a reference amount, weight or concentration.

Throughout this specification, unless the context requires otherwise, the words *"comprise"*, *"comprises"* and *"comprising"* will be understood to imply the inclusion of a stated step or element or group of steps or elements but not the exclusion of any other step or element or group of steps or elements.

By "*effective amount*", in the context of treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by enhanced nitric oxide levels, in a patient, or for promoting a response which requires augmentation of nitric oxide levels in a patient, is meant the administration of that amount of active(s) to the patient, either in a single dose or as part of a series, that is effective for that treatment, prevention, or promotion. The effective amount will vary depending upon the health and physical condition of the patient to be treated, the formulation of the composition, the assessment of the condition, and other relevant factors. It is expected that the amount will fall in a relatively broad range that can be determined through routine trials.

The term *"patient"* refers to human patient and includes any individual it is desired to examine or treat using the methods of the invention. However, it will be understood that *"patient"* does not imply that symptoms are present.

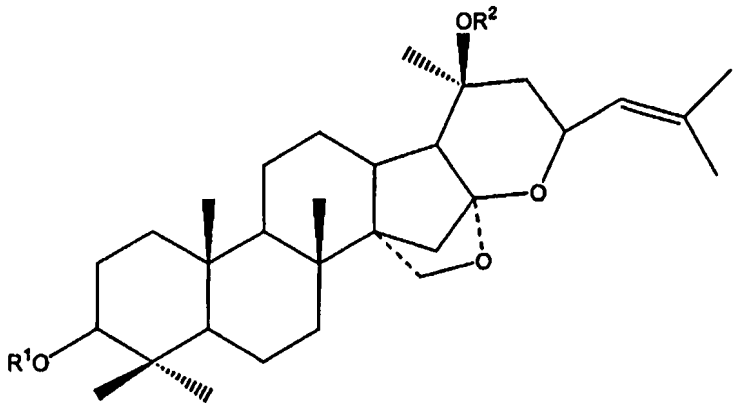
By *"pharmaceutically acceptable carrier and/or diluent"* is meant a solid or liquid filler, diluent or encapsulating substance that can be safely used in topical or systemic administration to a patient.

2. Compositions and methods of the invention

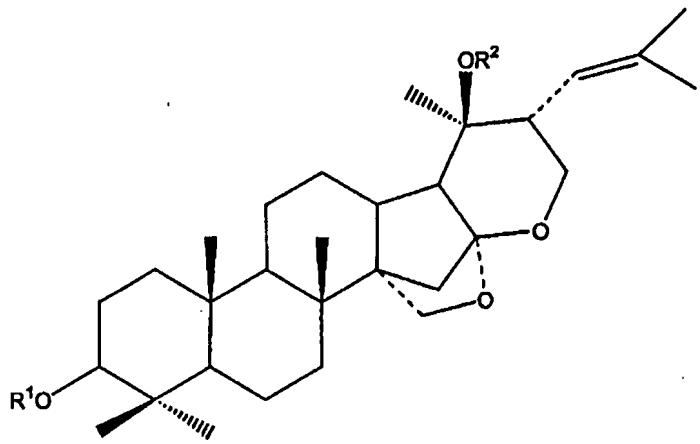
The present invention is generally directed to pharmaceutical compositions comprising at least one dammarane-type triterpenoid saponin, which is preferably a pseudojujubogenin glycoside, or derivative or analogue or pharmaceutically acceptable salt thereof. Saponin compounds of this type have been found unexpectedly to enhance the production of nitric oxide in human cells and tissues, which renders them useful for treating conditions associated with reduced nitric oxide levels within the human body which conditions are ameliorable or preventable by augmentation of nitric oxide levels, or for treating or preventing conditions which are ameliorable or preventable by enhanced nitric oxide levels within the human body, or for promoting responses which requires augmentation of nitric oxide levels within the human body.

Thus, the invention also encompasses use of the at least one dammarane-type triterpenoid saponin or derivative or analogue or pharmaceutically acceptable salt thereof as described herein, and optionally a pharmaceutically acceptable carrier and/or diluent, for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by augmentation of nitric oxide levels, within a patient, or for promoting a condition which requires elevation of nitric oxide levels within a patient.

The dammarane-type triterpenoid saponin is suitably a pseudojujubogenin glycoside. In a preferred embodiment, the dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



(I)



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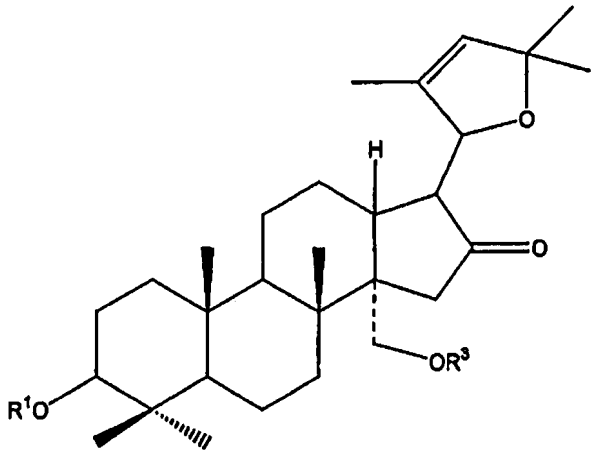
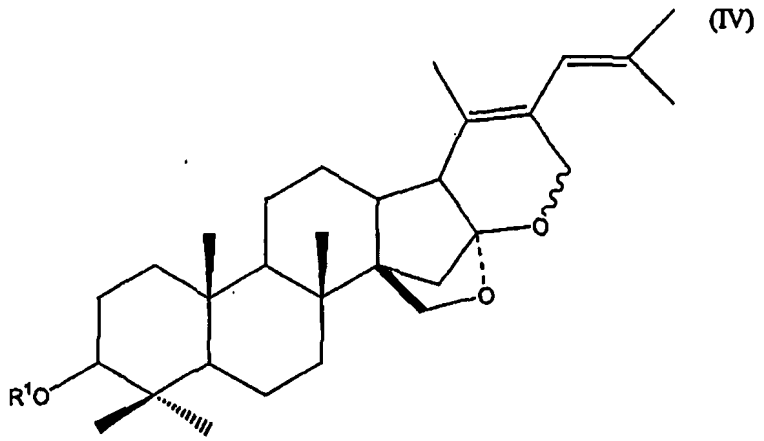
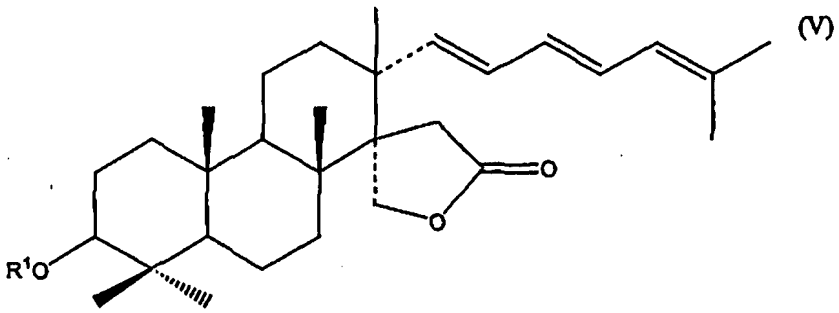


(III)





wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including

linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

In a preferred embodiment of compound (I) including derivatives thereof, R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

In a preferred embodiment of compound (II) including derivatives thereof, R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

In a preferred embodiment of compounds (III) including derivatives respectively thereof, R^1 is H and R^3 is H.

In a preferred embodiment of compounds (IV) and (V) including derivatives respectively thereof, R^1 is H.

In an especially preferred embodiment, the compound is selected from bacopasaponin A, bacopasaponin B, bacopasaponin C and bacopasaponin D, bacopasaponin E, bacopasaponin F, or analog or derivative thereof.

Derivatives of the above compounds include, but are not restricted to, ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, and any combination of two or more of the foregoing.

In another embodiment, one or more compounds as broadly described above are derived from a plant of the genus *Bacopa* and preferably from *Bacopa monnieri* (Brahmi) or a botanical or horticultural relative thereof. Thus, for the practice of the present invention in another embodiment, the invention contemplates the use of a chemical fraction comprising at least one dammarane-type triterpenoid saponin from a plant of the

genus *Bacopa* or a derivative or analogue of said triterpenoid saponin having a structure as defined above wherein said triterpenoid saponin or its derivative or chemical analogue modulates nitric oxide production in humans or other primates. Reference herein to a plant of the genus *Bacopa* includes reference to *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*. Preferably, the chemical fraction is obtained from *Bacopa monnieri*.

In another embodiment, one or more of the aforementioned compounds may be purified from a plant of the genus *Bacopa* by any suitable method including the methods described for example by Chatterjee *et al.* (1963, Indian Journal of Chemistry **1**: 212), Singh *et al.* (1988, *Phytother. Res.* **2**: 70), Rastogi *et al.* (1994, *Phytochemistry* **36**: 133-137) Garai *et al.* (1996, *Phytochemistry* **42**: 815-820), Garai *et al.* (1996, *Phytochemistry* **43**: 447-449), Kulshreshtha *et al.* (1973, *Phytochemistry* **12**: 887), Kawai *et al.* (1973, *Acta Cryst* **829**: 2947), Kulshreshtha *et al.* (1974, *Phytochemistry* **12**: 1205), Chandel *et al.* (1997, *Phytochemistry* **16**: 141) and Kulshreshtha *et al.* (1973, *Phytochemistry* **12**: 2074). An especially preferred chemical fraction of *Bacopa monnieri* (Brahmi) is described in Example 1.

The invention, therefore, also encompasses use of a saponin-containing extract or fraction of a plant from the genus *Bacopa* as described herein, optionally together with a pharmaceutically acceptable carrier and/or diluent, for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by augmentation of nitric oxide levels, within a patient, or for promoting a condition which requires elevation of nitric oxide levels within a patient.

Thus, the triterpenoid saponin compounds, or the saponin containing extract, of the invention can be used as actives for treating conditions which are associated with reduced nitric oxide levels, or which are ameliorable or preventable by augmentation of the nitric oxide levels, in a patient. The conditions include, but are not restricted to: Alzheimer's disease; sickle cell disease, sickle cell trait; vascular associated conditions; hypertension and angina; involuntary muscle movement (spasms) or muscle cramps; hepatic conditions; inflammatory conditions (*e.g.*, chilblains); kidney disorders; diabetes (*e.g.*, diabetes mellitus); obesity; migraine and migraine syndrome; drug addiction (*e.g.*,

tobacco, marijuana, alcohol etc.); normal pregnancy; preeclampsia; spontaneous preterm labour; aging; menopause associated symptoms (*e.g.*, hot flushes); congenital defects (*e.g.*, limb reduction defects); piles; psoriasis; obesity; attention deficit hyperactivity disorder (ADHD); fatigue-related disorders (*e.g.*, chronic fatigue syndrome); hair loss (*e.g.*, male-pattern baldness, age-related baldness); respiratory distress (*e.g.*, pulmonary congestion); female infertility, male infertility; male sexual dysfunction; drug addiction; *Helicobacter* associated inflammation of the gastric mucosa; AIDS; travel sickness; and osteoclastic bone resorption.

In preferred embodiments, the condition is selected from any one of Alzheimer's disease, a vascular associated condition, a cancer or tumour, and an infection by a pathogenic organism.

In another preferred embodiment, the condition is a vascular associated condition. For example, the vascular associated condition in one embodiment may be selected from the group consisting of transient ischaemic attack, ischaemic stroke, and lacunar infarction. In another embodiment, the vascular associated condition is suitably coronary artery and peripheral atherosclerotic disease. The vascular associated condition in another embodiment is suitably coronary artery and peripheral angiospastic disease. In a further embodiment, the vascular associated condition is suitably restenosis after angioplasty. In yet another embodiment, the vascular associated condition is hypertension. In yet another embodiment, the vascular associated condition is angina.

In an alternate embodiment, the condition is suitably a kidney disorder (*e.g.*, nephritis, renal calculus associated nephritis, etc).

In yet another embodiment, the condition is suitably a hepatic condition (*e.g.*, septic and haemorrhagic shock affecting the liver, hepatic ischaemia reperfusion, cirrhosis of the liver).

In still yet another embodiment, the condition is inflammation. The inflammation includes, but is not limited to, that which is associated with disorders such as Addison's disease, adult respiratory distress syndrome, allergies, anaemia, asthma, atherosclerosis, bronchitis, cholecystitis, Crohn's disease, ulcerative colitis, atopic dermatitis, chilblains, dermatomyositis, diabetes mellitus, emphysema, atrophic gastritis, glomerulonephritis,

gout, Graves' disease, hypereosinophilia, irritable bowel syndrome, lupus erythematous, multiple sclerosis, myasthenia gravis, myocardial or pericardial inflammation, osteoarthritis, osteoporosis, pancreatitis, polymyositis, rheumatoid arthritis, osteoarthritis or degenerative joint diseases, scleroderma, Sjogren's syndrome, and autoimmune thyroiditis; complications of cancer, haemodialysis, extracorporeal circulation; viral, bacterial, fungal, parasitic, protozoal, and helminthic infections; and trauma.

The dammarane-type triterpenoid saponin compounds, or saponin-containing extract or fraction, of the invention can also be used as active(s) for promoting in a patient a response, which is facilitated by augmentation of nitric oxide levels. Such response includes, but is not restricted to, promoting vasodilation, reducing blood pressure, inhibiting amyloid β peptide production, enhancing neuronal growth, increasing anti-oxidant levels, reducing oxidative stress levels, increasing lactation, improving nutritional quality (*e.g.*, enhanced vitamin content) of breast milk, increasing telomerase activity, increasing bone formation, decreasing osteoclast bone resorption, increasing or continuing brain or neural activities, enhancing wound healing, promoting weight loss; enhancing hepatic cytoprotection or ameliorating liver damage, improving fertility and improving health or maintaining well being.

The actives of the present invention also have the effect of enhancing the immune function of a patient, and serve as preventive and therapeutic agents for various maladies and infectious diseases by virtue of this effect, so that the diseases against which this composition or agent is efficacious are not particularly limited. The actives of the present invention have also utility in preventing or otherwise inhibiting infection by a pathogenic organism. For example, the pathogenic organism includes, but is not restricted to, a bacterium (*e.g.*, *H. pylori*), and a virus (*e.g.*, HIV, *Influenzavirus*, *Parainfluenzavirus*, etc).

It will of course be appreciated that the foregoing effects or responses are merely illustrative of the diverse effects produced by nitric oxide and/or by the compounds of the invention and should, therefore, not be regarded as exclusive.

The actives can be administered to a patient either by themselves or in compositions where they are mixed with a suitable pharmaceutically acceptable carrier and/or diluent. Accordingly, the invention also provides a composition for effecting the

above treatment, prevention or enhancement, comprising a dammarane-type triterpenoid saponin as broadly described above, or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent.

Depending on the specific conditions being treated, the active(s) may be formulated and administered systemically or locally. Techniques for formulation and administration may be found in "Remington's Pharmaceutical Sciences," Mack Publishing Co., Easton, Pa., latest edition. Suitable routes may, for example, include oral, rectal, transmucosal, or intestinal administration; parenteral delivery, including intramuscular, subcutaneous, intramedullary injections, as well as intrathecal, direct intraventricular, intravenous, intraperitoneal, intranasal, or intraocular injections. For injection, the therapeutic agents of the invention may be formulated in aqueous solutions, preferably in physiologically compatible buffers such as Hanks' solution, Ringer's solution, or physiological saline buffer. For transmucosal administration, penetrants appropriate to the barrier to be permeated are used in the formulation. Such penetrants are generally known in the art. Intra-muscular and subcutaneous injection is appropriate, for example, for administration of immunogenic compositions and vaccines.

The agents can be formulated readily using pharmaceutically acceptable carriers well known in the art into dosages suitable for oral administration. Such carriers enable the compounds of the invention to be formulated in dosage forms such as tablets, pills, capsules, liquids, gels, syrups, slurries, suspensions and the like, for oral ingestion by a patient to be treated. These carriers may be selected from sugars, starches, cellulose and its derivatives, malt, gelatine, talc, calcium sulphate, vegetable oils, synthetic oils, polyols, alginic acid, phosphate buffered solutions, emulsifiers, isotonic saline, and pyrogen-free water.

Pharmaceutical compositions suitable for use in the present invention include compositions wherein the active ingredients are contained in an effective amount to achieve its intended purpose. The dose of active administered to a patient should be sufficient to effect a beneficial response in the patient over time such as, for example, an increase in nitric oxide levels in the patient or an increase in the health of the patient, a decrease in the symptom(s) associated with infection by a pathogenic organism etc. The

quantity of the active(s) to be administered may depend on the patient to be treated inclusive of the age, sex, weight and general health condition thereof. In this regard, precise amounts of the active(s) for administration will depend on the judgement of the practitioner. In determining the effective amount of the active to be administered in a said treatment, prevention or promotion, the practitioner may evaluate the progression of a condition to be treated or the progression of a sought-after response. In any event, those of skill in the art may readily determine suitable dosages of the active(s) of the invention.

Pharmaceutical formulations for parenteral administration include aqueous solutions of the active compounds in water-soluble form. Additionally, suspensions of the active compounds may be prepared as appropriate oily injection suspensions. Suitable lipophilic solvents or vehicles include fatty oils such as sesame oil, or synthetic fatty acid esters, such as ethyl oleate or triglycerides, or liposomes. Aqueous injection suspensions may contain substances that increase the viscosity of the suspension, such as sodium carboxymethyl cellulose, sorbitol, or dextran. Optionally, the suspension may also contain suitable stabilisers or agents which increase the solubility of the compounds to allow for the preparation of highly concentrated solutions.

Pharmaceutical preparations for oral use can be obtained by combining the active compounds with solid excipient, optionally grinding a resulting mixture, and processing the mixture of granules, after adding suitable auxiliaries, if desired, to obtain tablets or dragee cores. Suitable excipients are, in particular, fillers such as sugars, including lactose, sucrose, mannitol, or sorbitol; cellulose preparations such as., for example, maize starch, wheat starch, rice starch, potato starch, gelatin, gum tragacanth, methyl cellulose, hydroxypropylmethyl-cellulose, sodium carboxymethylcellulose, and/or polyvinylpyrrolidone (PVP). If desired, disintegrating agents may be added, such as the cross-linked polyvinyl pyrrolidone, agar, or alginic acid or a salt thereof such as sodium alginate. Such compositions may be prepared by any of the methods of pharmacy but all methods include the step of bringing into association one or more therapeutic agents as described above with the carrier which constitutes one or more necessary ingredients. In general, the pharmaceutical compositions of the present invention may be manufactured in a manner that is itself known, *e.g.*, by means of conventional mixing, dissolving, granulating, dragee-making, levigating, emulsifying, encapsulating, entrapping or lyophilising processes.

Dragee cores are provided with suitable coatings. For this purpose, concentrated sugar solutions may be used, which may optionally contain gum arabic, talc, polyvinyl pyrrolidone, carbopol gel, polyethylene glycol, and/or titanium dioxide, lacquer solutions, and suitable organic solvents or solvent mixtures. Dyestuffs or pigments may be added to the tablets or dragee coatings for identification or to characterise different combination of active compound doses.

Pharmaceutical which can be used orally include push-fit capsules made of gelatin, as well as soft, sealed capsules made of gelatin and a plasticiser, such as glycerol or sorbitol. The push-fit capsules can contain the active ingredients in admixture with filler such as lactose, binders such as starches, and/or lubricants such as talc or magnesium stearate and, optionally, stabilisers. In soft capsules, the active compounds may be dissolved or suspended in suitable liquids, such as fatty oils, liquid paraffin, or liquid polyethylene glycols. In addition, stabilisers may be added.

Dosage forms of the therapeutic agents of the invention may also include injecting or implanting controlled releasing devices designed specifically for this purpose or other forms of implants modified to act additionally in this fashion. Controlled release of an agent of the invention may be effected by coating the same, for example, with hydrophobic polymers including acrylic resins, waxes, higher aliphatic alcohols, polylactic and polyglycolic acids and certain cellulose derivatives such as hydroxypropylmethyl cellulose. In addition, controlled release may be effected by using other polymer matrices, liposomes and/or microspheres.

The active(s) of the invention may be provided as salts with pharmaceutically compatible counterions. Pharmaceutically compatible salts may be formed with many acids, including but not limited to hydrochloric, sulfuric, acetic, lactic, tartaric, malic, succinic, *etc.* Salts tend to be more soluble in aqueous or other protonic solvents that are the corresponding free base forms.

For any compound used in the method of the invention, the therapeutically effective dose can be estimated initially from cell culture assays. For example, a dose can be formulated in animal models to achieve a circulating concentration range that includes the IC50 as determined in cell culture (*e.g.*, the concentration of active(s), which achieves,

for example, a half-maximal enhancement in nitric oxide production, in vasodilation, in anti-oxidant levels, in neuronal growth, and/or in immune effector concentrations or which achieves a half maximal reduction in amyloid β peptide production (*e.g.*, in cerebral neurones) or in oxidative stress levels etc). Such information can be used to more accurately determine useful doses in patients.

Toxicity and therapeutic efficacy of such therapeutic agents can be determined by standard pharmaceutical procedures in cell cultures or experimental animals, *e.g.*, for determining the LD50 (the dose lethal to 50% of the population) and the ED50 (the dose therapeutically effective in 50% of the population). The dose ratio between toxic and therapeutic effects is the therapeutic index and it can be expressed as the ratio LD50/ED50. Compounds that exhibit large therapeutic indices are preferred. The data obtained from these cell culture assays and animal studies can be used in formulating a range of dosage for use in animals. The dosage of such compounds lies preferably within a range of circulating concentrations that include the ED50 with little or no toxicity. The dosage may vary within this range depending upon the dosage form employed and the route of administration utilised. The exact formulation, route of administration and dosage can be chosen by the individual practitioner in view of an animal's condition. (See for example Fingl *et al.*, 1975, in "The Pharmacological Basis of Therapeutics", Ch. 1 p1).

Dosage amount and interval may be adjusted individually to provide plasma levels of the active(s) which are sufficient to maintain augmented nitric oxide levels, immune effector enhancement, vasodilation, reduced blood pressure, reduced amyloid β peptide production, enhanced neuronal growth, increased anti-oxidant levels, reduced oxidative stress levels, enhanced or improved lactation, increased telomerase activity, increased bone formation, reduced osteoclast bone resorption, increased or continuing brain or neural activities, enhanced wound healing, improved fertility and improved health or maintenance of well being. Usual patient dosages of an extract prepared according to Example 1, containing 65 wt.% bacopasaponins, for systemic administration range from 10-2000 mg/day, commonly from 40-1500 mg/day, and typically from 300-1200 mg/day. Preferably, the dosage of said extract ranges from between about 400 and about 800 mg/day. Stated in terms of body weight, usual dosages of said extract range from between about 0.1 and about 30 mg per kg per day, commonly between about 0.5 and about 25 mg

per kg per day, typically between about 2 and 20 mg per kg per day. Preferably, the dosage of said extract ranges from between about 5 and about 12 mg per kg per day.

Alternately, one may administer the compound(s) in a local rather than systemic manner, for example, via injection of the compound directly into a tissue, often in a depot or sustained release formulation.

Furthermore, one may administer the active in a targeted drug delivery system, for example, in a liposome coated with tissue-specific antibody. The liposomes will be targeted to and taken up selectively by the tissue.

In cases of local administration or selective uptake, the effective local concentration of the active may not be related to plasma concentration.

In order that the invention may be readily understood and put into practical effect, particular preferred embodiments will now be described by way of the following non-limiting examples.

EXAMPLES

EXAMPLE 1

Preparation of bacopasaponin extract from Bacopa monnieri *(Brahmi)*

A sample of *Bacopa monnieri* (Brahmi) (1.0g) was macerated in 3 x 25-mL of dry acetone (dried over potassium carbonate). The macerate was filter/centrifuged each time and the residue was dried under vacuum. Ten milligrams of powdered extract was heated with 5 drops of orthophosphoric acid in a test tube (or until filter paper kept moist on the mouth of the test tube with aniline acetate turns pink).

Two hundred and fifty milligrams of powdered extract was hydrolysed by boiling with 4N; 50% (v/v) aqueous ethanolic sulphuric acid (5 mL). The ethanol was subsequently removed under vacuum. The aqueous suspension was extracted with two quantities, 5 mL each of freshly washed (phosgene free) chloroform. The combined chloroform layer was neutralised by washing with 0.1% (v/v) aqueous solution of ammonia, followed by 2 washes with water, followed by drying over anhydrous sodium sulphate and evaporating the solvent to dryness. The 0.001% (w/v) solution of the residue in methanol exhibited characteristic maxima at 269, 278 and 289 nm.

EXAMPLE 2

Chromatographic fingerprint of bacopasaponin extract

Thin layer chromatography was carried out using silica gel G plates of 0.2-mm thickness and a mixture of 8 parts of ethylacetate, 1 part methanol and 1 part water as the mobile phase. One mL of test solution containing the extract of Example 1 at about 1 μg/mL is then added to 1 mL 4N aqueous sulphuric acid (A.R.). This mixture was refluxed on a water-bath for 4 hours, allowed to cool and diluted with 4 mL distilled water before the methanol was removed under vacuum. The aqueous solution was then extracted four times with chloroform (G.R., phosgene free) and the combined chloroform extract was washed with 0.1% solution of a base (*e.g.* ammonia), followed by twice with distilled water. The extract was dried over anhydrous sodium sulphate and the chloroform removed under vacuum. The residue was dissolved in methanol (A.R.) up to a final volume of 10

mL. The optical density (O.D.) of the solution was then determined at 278 nm against a blank. The content of bacosaponin in the extract was calculated by running reference standard bacosaponins side by side, or by using the following linear regression curve formula:

$C = K \times O.D. + B$
(where, C = concentration of bacopasaponin in $\mu g/mL$:
K = 50.957 and
B = 1.2974

EXAMPLE 3

Preparation of Arterial Rings

Male New Zealand white rabbits of 2-3 kg were killed by a blow to the head. From these animals selected arteries were carefully dissected, applying minimal traction to avoid stretching and taking care not to subject the intima to rubbing either with instruments or upon itself. In the case of canine coronary and pulmonary arteries, dissection was carried out after excision of the heart and lungs from the animal. Small segments of arteries of human mesentery were obtained from tissue removed in the course of surgery for resection of the bowel. After dissection, arteries were quickly immersed in Krebs solution. Transverse rings of arteries were prepared in a manner similar to that described previously (Furchgott *et al.*, 1980, *Nature* **288**: 373-376; Cherry *et al.*, 1982, *Proc Natl Acad Sci U S A* 79(6): 2106-2110). In brief, the arteries were carefully cleaned of any adherent fat and connective tissue and cut into 2.5-mm ring segments with a razor blade slicing device. The rings were mounted on pairs of stainless steel wire hooks and placed in 20-mL all-glass muscle chambers containing Krebs solution at 37 °C.

Intimal endothelial cells were removed either prior to introduction of the rings in the chambers or after testing with vasoactive agents. In either case, the ring was left on the hooks and a 2 g weight was attached to the lower hook. A small wooden stick was then inserted into the lumen and rubbed gently on the intimal surface for 30 to 60 secs. To test the effectiveness of this treatment in removing endothelial cells, we sometimes made histological observations of the intimal surface of rubbed and unrubbed preparations at the end of an experiment, using a silver staining technique. Relaxation of isolated arteries by acetylcholine (AcCho) is directly related to the presence of endothelial cells. Therefore, in

all experiments the effectiveness of the rubbing procedure in removing endothelial cells was ascertained by a functional test using AcCho. The complete loss of the relaxing response to this agent indicated an essentially complete loss of endothelial cells.

EXAMPLE 4

Bathing Solution and Drugs

The bathing fluid was Krebs solution of the following composition (mM); NaCl, 118; KCl, 4.8; $CaCl_2$, 2.5; $MgSO_4$, 1.2; KH_2PO_4, 1.2; $NaHCO_3$, '24; glucose, 11; Na_2EDTA, 0.03. The solution was continuously gassed with 95% O_2/5% CO_2, resulting in a pH of 7.4.

Drugs used in this study were: *l*-norepinephrine (NE) bitartrate, AcCho chloride, indomethacin (IND), bradykinin (BKN) triacetate, quinacrine (Q) dihydrochloride (Sigma); 5, 8, 11, 14-icosatetraynoic acid (ETYA) (Hoffmann-La Roche), sodium flurbiprofen (FBP) (Allergan, Irvine, CA), and the sodium salt of prostacyclin and the tromethamine salt of PGF_2). All drugs were prepared as aqueous solutions except for ETYA and indomethacin, which were dissolved in absolute ethanol to make, respectively, 33 and 40 mM stock solutions.

EXAMPLE 5

Recording

Tension changes induced in arterial preparations were measured with FT-03 isometric strain gauges and recorded on a four-channel model 7 polygraph (Grass). Resting tension was adjusted by means of a rack-and-pinion clamped to the strain gauge. Baseline tension was set at 2 g after an equilibration period of at least 90 min (1 g tension = 9.8 millinewtons).

EXAMPLE 6

Induction of vascular nitric oxide production

Rings of rabbit aorta were prepared and mounted in 20-mL muscle chambers. Endothelial cells were removed by rubbing the intimal surface of the rings with a small wooden stick.

Neutral nitrite solutions were made by serial dilution with 1 M $NaNO_2$ in distilled water. Acidified nitric solutions were made by serial dilution with 1 M $NaNO_2$ in either unbuffered isotonic physiological salt solution containing 0.1% of concentrated HCl, or in distilled water containing that amount of HCl. The final concentration of the added HCl was 11 mM. However the pH attained varied with different concentrations of nitrite because of its buffering capacity (pKa of HNO_2, 3.2). At 100 mM nitrite, pH was 4.1; at 10 mM, pH was 2.5; at 1 mM or less, the pH was 2.0. Equivalent acidified nitrite solutions made with saline and with water had identical pharmacological activity and therefore will not be differentiated in this report of experimental results. In some experiments, the pH of all concentrations of nitrite was made uniform with added HCl (eg., all adjusted to pH 2): in other experiments, several solutions of a single concentration of nitrite were adjusted to various levels of pH. It should be noted that the amount of bicarbonate on the 20 ml of Krebs solution in each muscle chamber greatly exceeded the total amounts of acid contributed by the additions of acidified nitrite solutions, so that the pH of the Krebs solution bathing an aortic ring remained essentially constant despite multiple additions of acidified nitrite solutions. Testing of nitrite solutions for relaxing effects was carried out on rings contracted to a moderate level of tone (usually 25 to 60% of maximum) with phenylephrine.

The 1 M $NaNO_2$ used for making dilutions of nitrite, both acidified and neutral, was made fresh from solid $NaNO_2$ on the day of use. Unless otherwise indicated, all dilutions were kept in an ice bath throughout the course of the experiment.

Solutions of haemoglobin and methaemoglobin were prepared from bovine haemoglobin (Sigma, St. Louis, MO.). Solutions of superoxide dismutase were made from lyophilised erythrocyte enzyme (Sigma).

The bacopasaponin extract prepared according to Example 1 was tested for use in the blood stream based upon experiments using rabbit aorta. The extract appears to release nitric oxide at a concentration in the range of approximately 200 micrograms under the test conditions. The compound causes at least 75 percent relaxation in aortic rings with intact endothelium, whereas it gave approximately 10 to 15 percent relaxation in rings without endothelium. The vasodilation caused by this compound is effectively blocked by haemoglobin, a scavenger of nitric oxide as well as 1H-[1,2,4]oxadiazolo[4,3-a]quinoxalin-1-one (ODQ), a specific inhibitor of soluble guanylate cyclase indicating the involvement of guanylate cyclase (enzyme) in vasodilation. Also, 'L-Nmono methyl arginine, an inhibitor of nitric oxide synthase blocks the vasodilation, indicating the involvement of nitric oxide synthase in vasodilation.

An elevation of cGMP has been reported using membrane from brain cells. It is believed that any action of nitric oxide resulting in vasodilation is accompanied by an elevation of cGMP.

In the experimental biological testing studies conducted, a concentration of about 4g/mL was utilised. A solution of about 2g/mL (in 10 mg/mL of dimethyl sulfoxide) was made and 200 μL of this solution was added to the organ chamber containing the aortic ring under 2g tension.

The following experiment was conducted to establish specifically that the ingestion of the bacopasaponin extract into the system releases nitric oxide from endothelial cells.

Four rings of rabbit aorta were mounted in organ chambers having a 20-mL volume. The rings were bathed in Krebs-bicarbonate solution having a pH of 7.4 continuously bubbled with oxygen; carbon dioxide 95.5% at 37 °C. The rings were put under a tension of 2 g and the tension recorded using a grass polygraph model 7D recorder.

The rings were contacted with phenylephrine at a concentration of 0.3 μM. The ability of these rings to relax upon the addition of acetylcholine is shown in the first part of the graph (Figure 1). A dose dependent relaxation with acetylcholine shows that the rings contain endothelial cells.

The bacopasaponin extract prepared according to Example 1 was dissolved in dimethyl sulfoxide (in 10mg/mL of DMSO) and 200 μL of the bacopasaponin-containing solution was used to study the effect of this compound on the aortic rings. All aortic rings were contracted with phenylephrine and the bacopasaponin solution was added in three steps of 20, 40 and 140 μL. Ring A was kept as a control without any addition of blocker or inhibitor. To ring B, L N monomethyl arginine (LNMMA), which is a blocker of nitric oxide synthase, was added. The addition of LNMMA completely reversed the relaxation as seen in Figure 1. To ring C, ODQ, which is a guanylate cyclase inhibitor, was added and this resulted in the complete reversal of the relaxation by the bacopasaponins. Guanylate cyclase is involved in all relaxation processes involving nitric oxide. To ring D, haemoglobin, a powerful scavenger of nitric oxide was added which also resulted in complete reversal of relaxation.

The experimental data described above and depicted in Figure 1 establishes that bacopasaponins release nitric oxide from endothelial cells.

EXAMPLE 7

Enhancing growth of neuronal cells

Human neuroblastoma cells were grown in tissue culture and physical changes in the neurones in the presence and absence of bacopasaponins were studied. For this, various amounts of the bacopasaponin extract prepared according to Example 1 were added to individual cultures of neuronal cells and 48 hours after the addition of the bacopasaponins, cells were analysed microscopically. Figure 2 shows the control neuroblastoma cells 48 hours after seeding. Figure 3 shows the morphological changes in neuronal cells with 1 μg/mL of bacopasaponins. Even at this low concentration cellular elongation and induction of neuronal filament formation is clear.

Figures 4 and 5 show the addition of 100 and 200 μg/mL of the drug respectively. These two concentrations exhibited two properties. Firstly there was an increase in neuronal filament formation (*i.e.*, filament formation was observed in every viable cell in the culture with these two concentrations). Secondly, the cell number increased by 30% in the presence of the bacopasaponins and the cells appeared to be healthier. Further, higher concentrations of the drug did not show additional morphological changes. In fact 500

μg/mL has shown some cellular shrinkage and even some cell death. Prolonged incubation with 500 μg/mL did cause recovery of the cells and eventual filament formation. The filament formation is essential for cell-cell contact.

EXAMPLE 8

Biochemical studies using the tissue culture experiments

Preliminary investigations of amyloid precursor protein expression (APP) and desaturases showed that the bacopasaponins might potentially regulate amyloid processing and also increase desaturase levels. Expression of both these proteins is affected during aging. APP increases with age and desaturase decreases with age. The bacopasaponins, in this regard, appear to reduce APP expression and increase desaturase expression, which would be beneficial to individuals afflicted with Alzheimer's disease. In a preliminary *in vitro* study using HeLa cells transfected with mouse APP, it was found that APP expression is significantly reduced in the presence of bacopasaponin extract prepared according to Example 1 at concentrations ranging from 1 μg/mL to 500 μg/mL.

EXAMPLE 9

Involuntary muscle movements and muscle cramps

A patient suffering chronic (3-4 years) severe leg cramps was given 300 mg of extract prepared according to Example 1 in tablet form (comprising about 50 wt.% bacopasaponins) twice daily (*i.e.*, one in the morning and one at night). After two days of treatment, the cramps declined in number and severity to approximately two per week, in waking hours. After three weeks of taking 300 mg of said extract three times daily (*i.e.*, two in the morning and one at night) the cramps disappeared completely and the involuntary muscle movements diminished considerably. Cramping during the day was non existent.

EXAMPLE 10

Chilblains

A patient who was suffering chilblains to her fingers and who had suffered from this condition during the past three winters, was given 300 mg of extract prepared according to Example 1 in tablet form (comprising about 50 wt.% bacopasaponins) twice daily (*i.e.*, one in the morning and one at night). Within three days of taking the tablets, the swelling and redness to her fingers had disappeared.

EXAMPLE 11

Enhancing quality and quantity of milk

Method

Twenty weeks after parturition 200 Indian Jersey cows were divided into the following 2 groups of 100 cows and fed a designated feed for 12 weeks: Group A where the basic feed as listed in Table 1 was given; Group B where 500 mg per day of an extract prepared according to Example 1, containing 45 wt.% bacopasaponins, mixed with a basic feed listed in Table 1, was given. The animals took water *ad libitum*.

TABLE 1

Ingredients of basic feed	Daily amount
grass	12 kg
Fodder: including	11 kg
cotton cake	450 g
ground nut fodder	400 g

Results

The Group B (treated) cows produced 16% more milk compared to Group A (control) cows. Milk obtained from the treated cows had 17% more protein (3.77 g/100 mL compared to 3.22 g/100 mL of milk for control cows), 23% more fat and 93% more β-carotene (150 μg/mL compared to 285 μg/mL of milk for control cows). When the supply of extract-containing feed to the Group B treated cows was withdrawn, milk yields reduced to normal levels after 15 days. It was also found quite unexpectedly that use of the bacopasaponin extract as a feed additive could substantially reduce the fodder intake per cow by about 20-25% without significantly reducing the amount or quality of the milk produced.

It was also found that milk obtained from Group B cows after five days of treatment comprised about 5 times more Vitamin A, about 2 to 9 times more Vitamin D, and about 4 to 7 times more Vitamin E compared to milk obtained from Group A cows (Table 2).

TABLE 2

	Milk		
	Group B cows (Sample 1)	Group B cows (Sample 2)	Group A cows
Vitamin A (IU/L)	12,8000	10,900	1600-2000
Vitamin D (IU/L)	3,600	800	400
Vitamin E (IU/L)	0.04	0.07	0.01

Although the above experiments were performed in cows, it is believed that the vitamin content of human breast milk can also be enhanced in a similar fashion using the compounds of the present invention. In this regard, it is believed that a corresponding improvement in the vitamin content of breast milk can be obtained by administering twice daily to a subject *post partum* 300 mg of extract prepared according to Example 1 (comprising about 50 wt.% bacopasaponins).

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The disclosure of every publication cited herein is hereby incorporated herein by reference in its entirety.

The citation of any reference herein should not be construed as an admission that such reference is available as "Prior Art" to the instant application

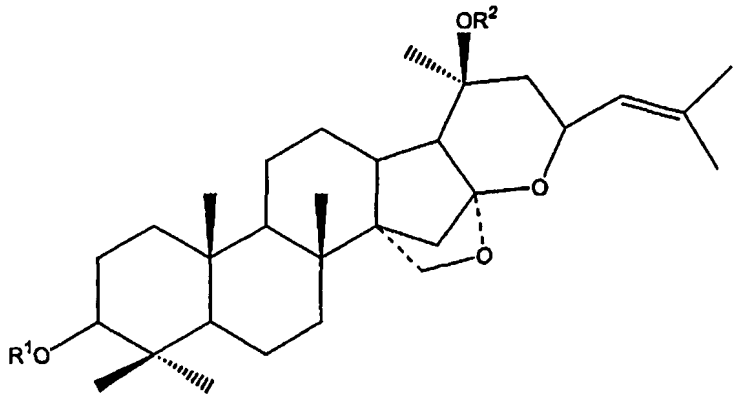
Throughout the specification the aim has been to describe the preferred embodiments of the invention without limiting the invention to any one embodiment or specific collection of features. Those of skill in the art will therefore appreciate that, in light of the instant disclosure, various modifications and changes can be made in the particular embodiments exemplified without departing from the scope of the present invention. All such modifications and changes are intended to be included within the scope of the appended claims.

CLAIMS

1. Use of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these in the preparation of a medicament for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by enhanced nitric oxide levels, within the human body, or for promoting a response requiring enhanced nitric oxide levels within the human body.

2. The use of claim 1, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

3. The use of claim 1, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



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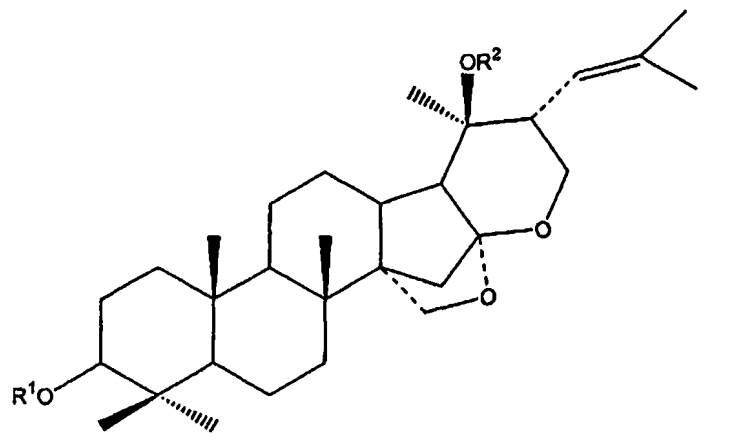

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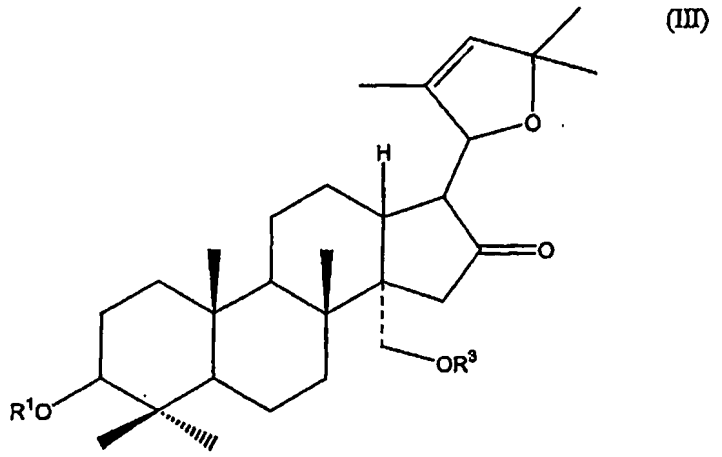

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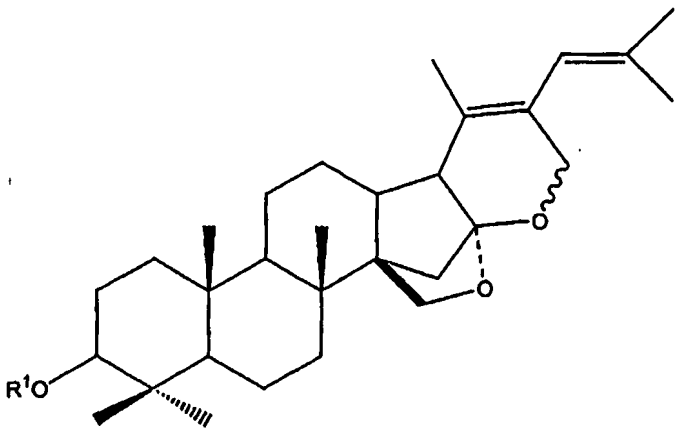

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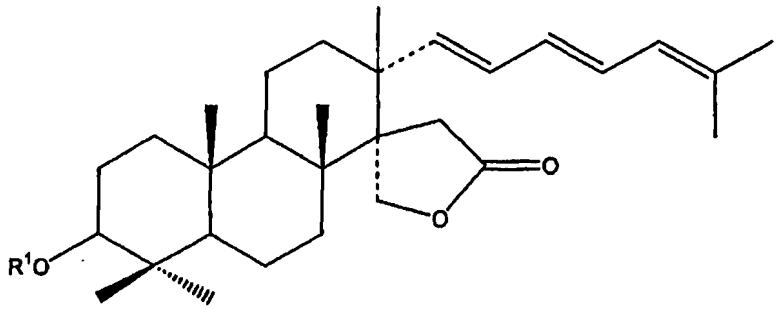


(V)

wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising

at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

4. The use of claim 3, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

5. The use of claim 3, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

6. The use of claim 3, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

7. The use of claim 3, wherein said compound has the general formula (IV) and R^1 is H.

8. The use of claim 3, wherein said compound has the general formula (V), R^1 is H.

9. The use of claim 1, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

10. The use of claim 1, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

11. The use of claim 1, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

12. The use of claim 11, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

13. The use of claim 11, wherein said plant is *Bacopa monnieri* (Brahmi).

14. The use of claim 11, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

15. The use of claim 1, wherein said condition is selected from Alzheimer's disease, a vascular associated condition, a cancer or tumour, inflammation, a kidney disorder, involuntary muscle movement, muscle cramp or a pathogenic infection.

16. The use of claim 15, wherein said vascular associated condition is selected from transient ischaemic attack, ischaemic stroke, lacunar infarction, coronary artery and peripheral atherosclerotic disease, coronary artery and peripheral angiospastic disease, restenosis after angioplasty, hypertension or angina.

17. The use of claim 15, wherein said kidney disorder is selected from nephritis or renal calculus associated nephritis.

18. The use of claim 15, wherein said hepatic condition is selected from septic and haemorrhagic shock affecting the liver, hepatic ischaemia reperfusion or cirrhosis of the liver.

19. The use of claim 15, wherein said inflammation is associated with a disease selected from: Addison's disease, adult respiratory distress syndrome, allergies, anaemia, asthma, atherosclerosis, bronchitis, cholecystitis, Crohn's disease, ulcerative colitis, atopic

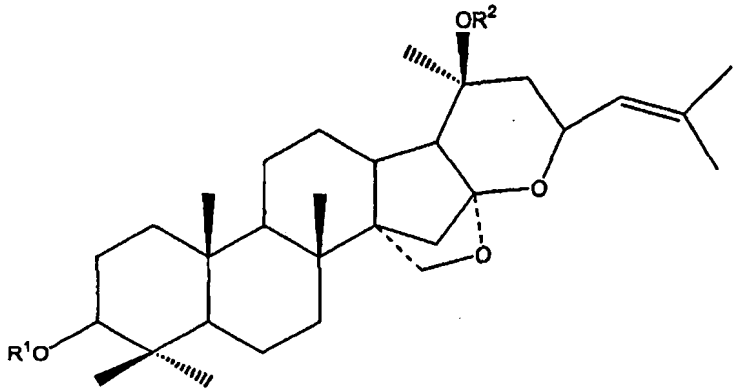
dermatitis, chilblains, dermatomyositis, diabetes mellitus, emphysema, atrophic gastritis, glomerulonephritis, gout, Graves' disease, hypereosinophilia, irritable bowel syndrome, lupus erythematous, multiple sclerosis, myasthenia gravis, myocardial or pericardial inflammation, osteoarthritis, osteoporosis, pancreatitis, polymyositis, rheumatoid arthritis, osteoarthritis or degenerative joint diseases, scleroderma, Sjogren's syndrome, and autoimmune thyroiditis; complications of cancer, haemodialysis, extracorporeal circulation; viral, bacterial, fungal, parasitic, protozoal, and helminthic infections; or trauma.

20. The use of claim 19, wherein said inflammation is associated with chilblains.

21. A method for treating or preventing a condition which is associated with reduced nitric oxide levels, or which is ameliorable or preventable by enhanced nitric oxide levels, in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to treat or prevent said condition.

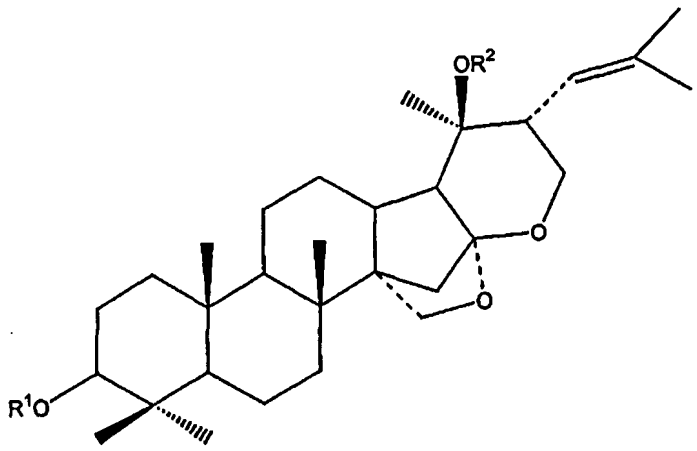
22. The method of claim 21, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

23. The method of claim 21, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:

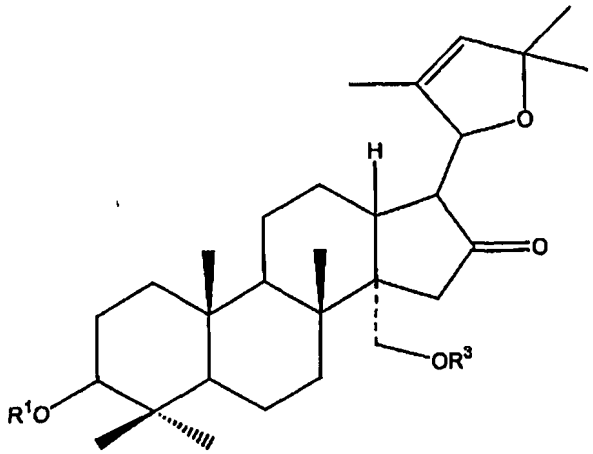


(I)

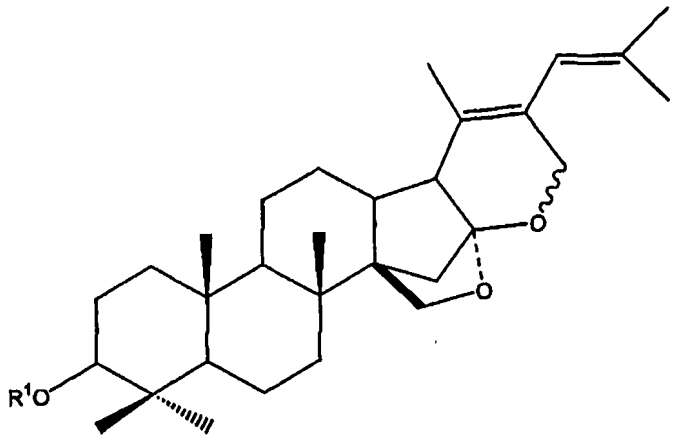
(II)



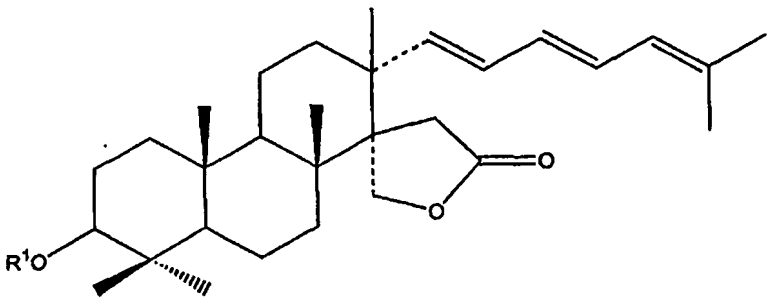
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

24. The method of claim 23, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

25. The method of claim 23, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

26. The method of claim 23, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

27. The method of claim 23, wherein said compound has the general formula (IV) and R^1 is H.

28. The method of claim 23, wherein said compound has the general formula (V), R^1 is H.

29. The method of claim 21, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

30. The method of claim 21, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

31. The method of claim 21, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

32. The method of claim 31, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

33. The method of claim 31, wherein said plant is *Bacopa monnieri* (Brahmi).

34. The method of claim 31, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

35. The method of claim 21, wherein said condition is selected from Alzheimer's disease, a vascular associated condition, a cancer or tumour, inflammation, a kidney disorder, involuntary muscle movement, muscle cramp or a pathogenic infection.

36. The use of claim 35, wherein said vascular associated condition is selected from transient ischaemic attack, ischaemic stroke, lacunar infarction, coronary artery and

peripheral atherosclerotic disease, coronary artery and peripheral angiospastic disease, restenosis after angioplasty, hypertension or angina.

37. The use of claim 35, wherein said kidney disorder is selected from nephritis or renal calculus associated nephritis.

38. The use of claim 35, wherein said hepatic condition is selected from septic and haemorrhagic shock affecting the liver, hepatic ischaemia reperfusion or cirrhosis of the liver.

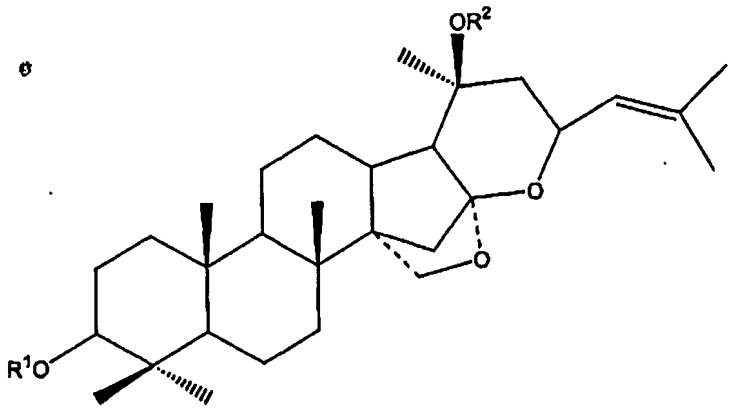
39. The use of claim 35, wherein said inflammation is associated with a disease selected from: Addison's disease, adult respiratory distress syndrome, allergies, anaemia, asthma, atherosclerosis, bronchitis, cholecystitis, Crohn's disease, ulcerative colitis, atopic dermatitis, chilblains, dermatomyositis, diabetes mellitus, emphysema, atrophic gastritis, glomerulonephritis, gout, Graves' disease, hypereosinophilia, irritable bowel syndrome, lupus erythematous, multiple sclerosis, myasthenia gravis, myocardial or pericardial inflammation, osteoarthritis, osteoporosis, pancreatitis, polymyositis, rheumatoid arthritis, osteoarthritis or degenerative joint diseases, scleroderma, Sjogren's syndrome, and autoimmune thyroiditis; complications of cancer, haemodialysis, extracorporeal circulation; viral, bacterial, fungal, parasitic, protozoal, and helminthic infections; or trauma.

40. The use of claim 39, wherein said inflammation is associated with chilblains.

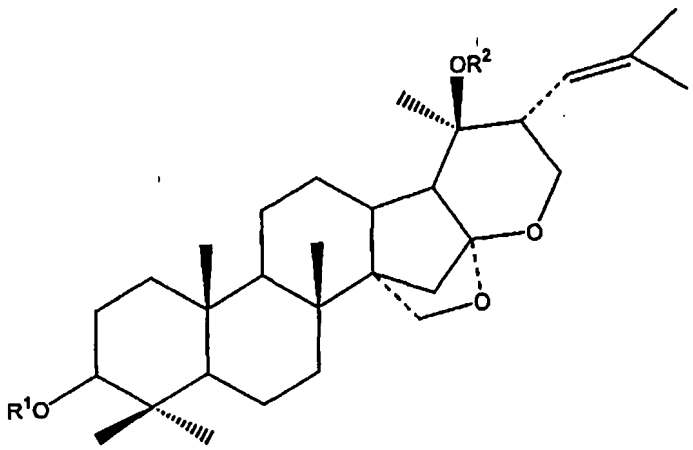
41. A method for promoting in a patient a response requiring enhanced or elevated nitric oxide levels, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to promote said condition.

42. The method of claim 41, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

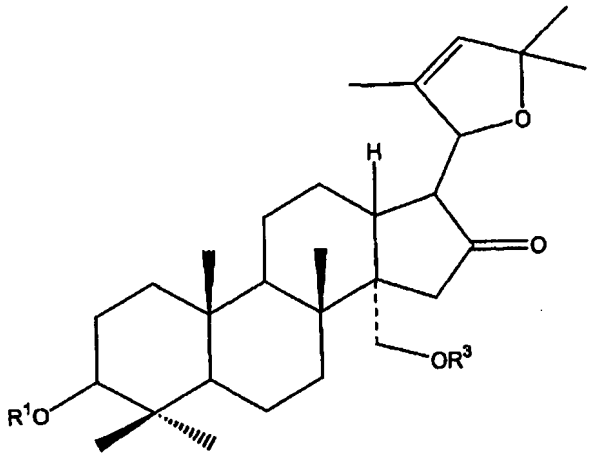
43. The method of claim 41, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



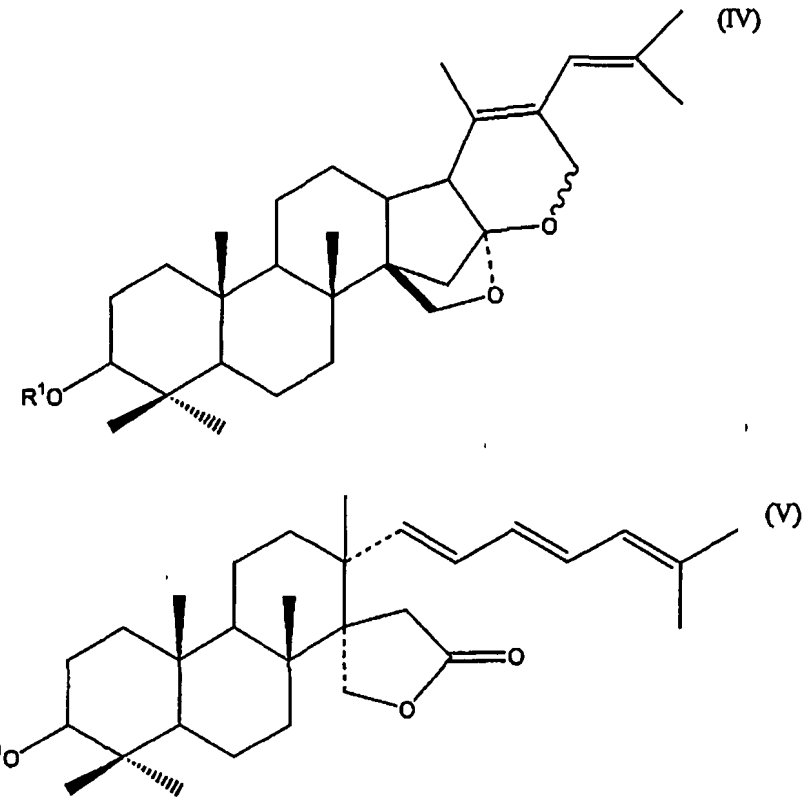
(I)



(II)



(III)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

44. The method of claim 43, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

45. The method of claim 43, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

46. The method of claim 43, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

47. The method of claim 43, wherein said compound has the general formula (IV) and R^1 is H.

48. The method of claim 43, wherein said compound has the general formula (V), R^1 is H.

49. The method of claim 41, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

50. The method of claim 41, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

51. The method of claim 41, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

52. The method of claim 51, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

53. The method of claim 51, wherein said plant is *Bacopa monnieri* (Brahmi).

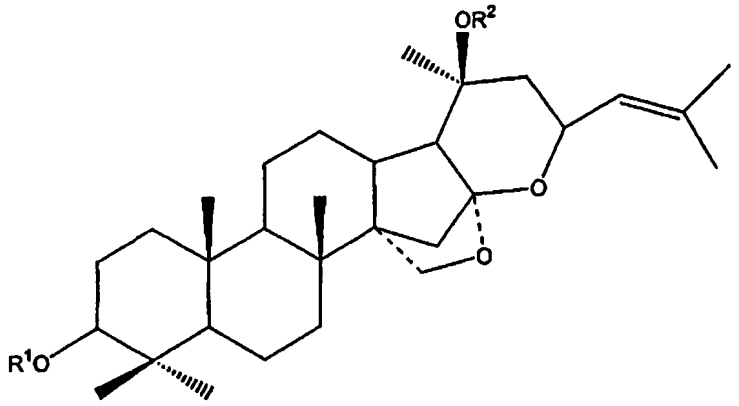
54. The method of claim 51, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

55. The method of claim 41, wherein said response is selected from vasodilation, reduced blood pressure, reduced amyloid β peptide production, increased bone formation, reduced osteoclastic bone resorption, increased or continuing brain or neural activities, enhanced wound healing, enhanced neuronal growth, enhanced or augmented immunity, increased anti-oxidant levels, reduced oxidative stress levels, enhanced lactation, improved nutritional quality of breast milk, improved fertility, inhibition of tumorigenesis, increased telomerase activity, enhanced hepatic cytoprotection or amelioration of liver damage, improved health or maintenance of well being or weight loss.

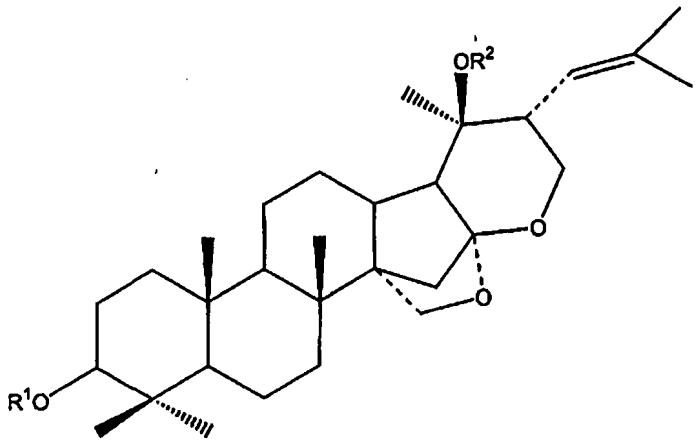
56. A method for enhancing or otherwise promoting vasodilation in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance or promote vasodilation.

57. The method of claim 56, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

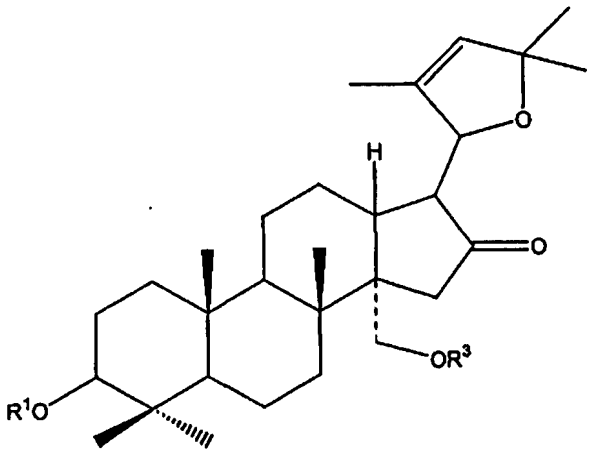
58. The method of claim 56, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



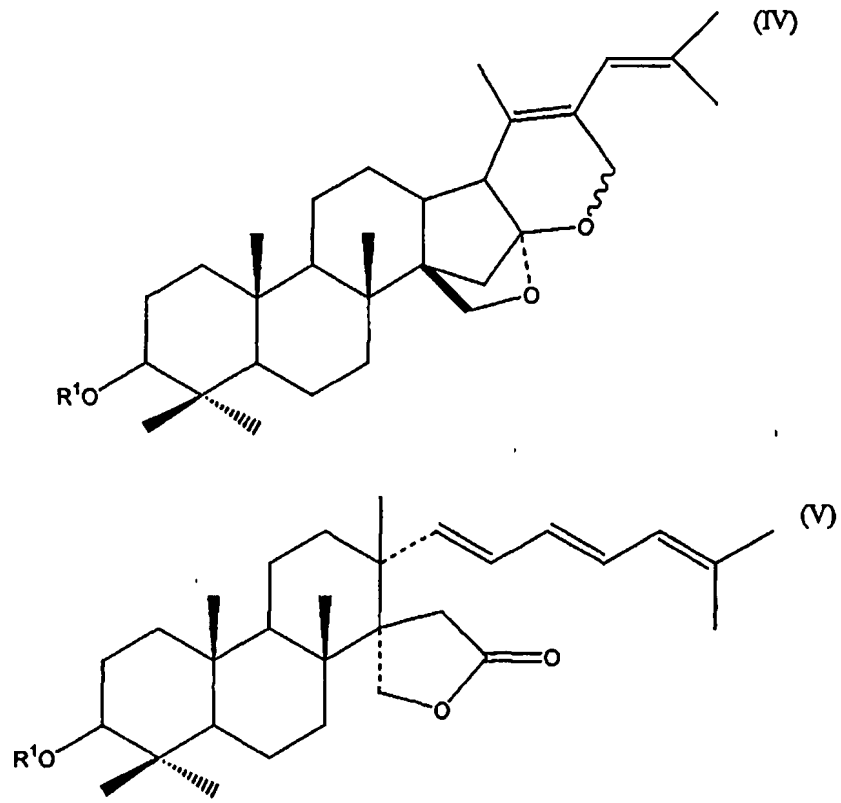
(I)



(II)



(III)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

59. The method of claim 58, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

60. The method of claim 58, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

61. The method of claim 58, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

62. The method of claim 58, wherein said compound has the general formula (IV) and R^1 is H.

63. The method of claim 58, wherein said compound has the general formula (V), R^1 is H.

64. The method of claim 56, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

65. The method of claim 56, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

66. The method of claim 56, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

67. The method of claim 66, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

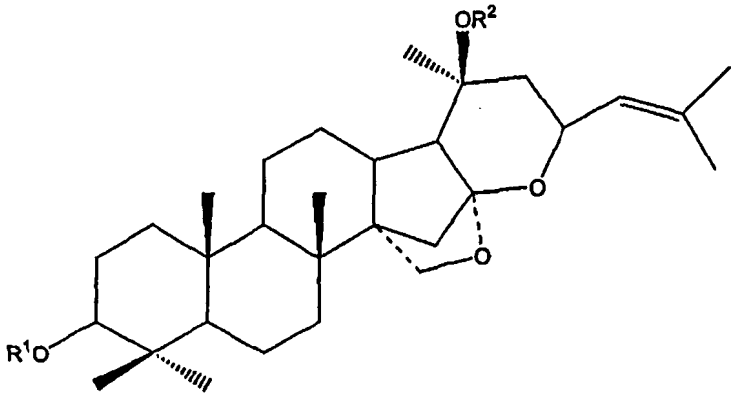
68. The method of claim 66, wherein said plant is *Bacopa monnieri* (Brahmi).

69. The method of claim 66, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

70. A method for reducing or otherwise inhibiting amyloid β peptide production in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to reduce or inhibit said production.

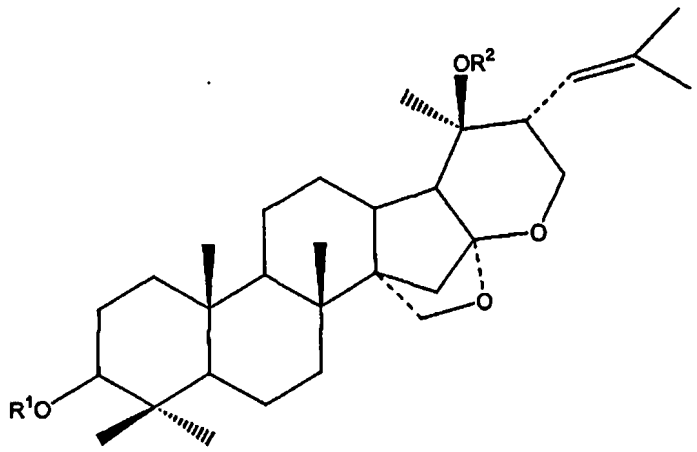
71. The method of claim 70, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

72. The method of claim 70, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:

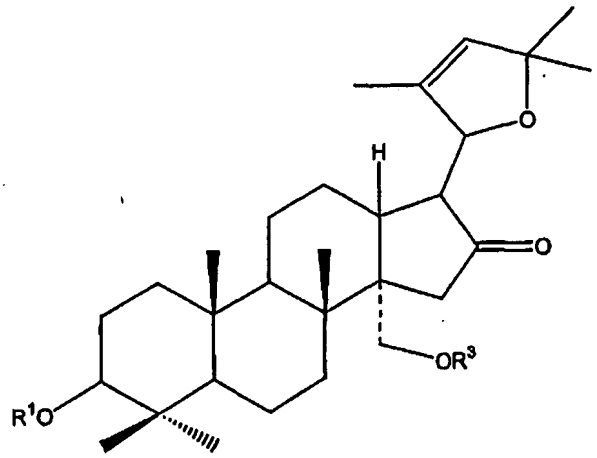


(I)

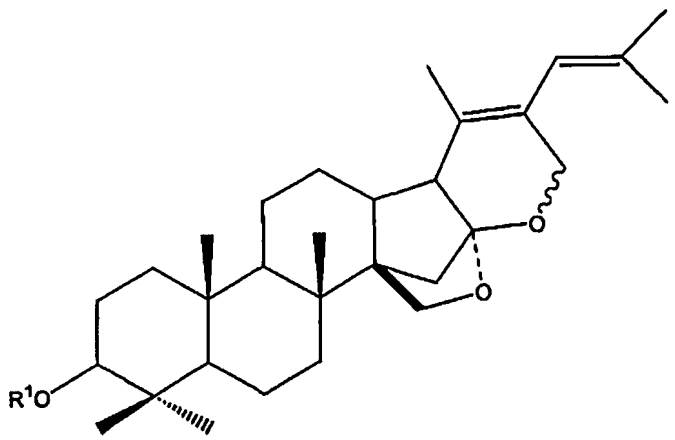
(II)



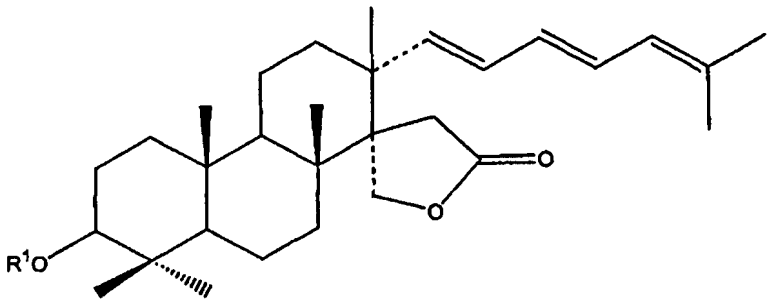
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

73. The method of claim 72, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

74. The method of claim 72, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

75. The method of claim 72, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

76. The method of claim 72, wherein said compound has the general formula (IV) and R^1 is H.

77. The method of claim 72, wherein said compound has the general formula (V), R^1 is H.

78. The method of claim 70, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

79. The method of claim 70, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

80. The method of claim 70, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

81. The method of claim 80, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

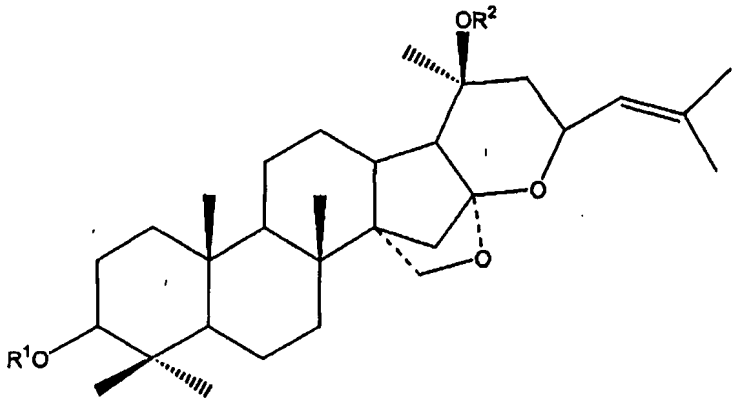
82. The method of claim 80, wherein said plant is *Bacopa monnieri* (Brahmi).

83. The method of claim 80, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

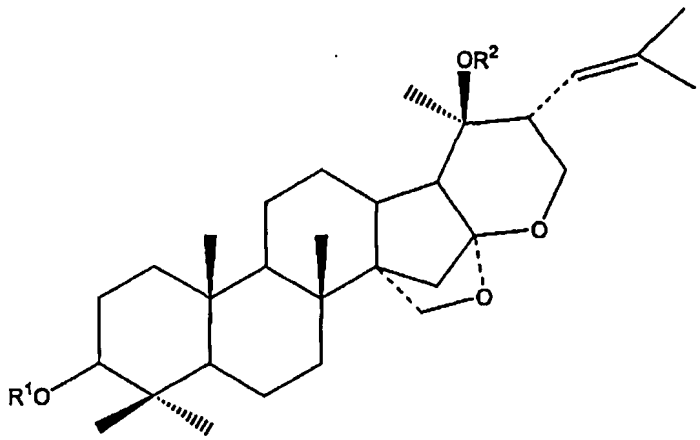
84. A method for enhancing or otherwise promoting neuronal growth in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance or promote said growth.

85. The method of claim 84, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

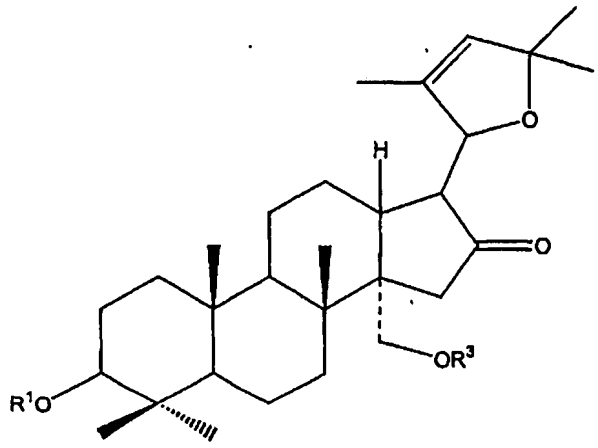
86. The method of claim 84, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



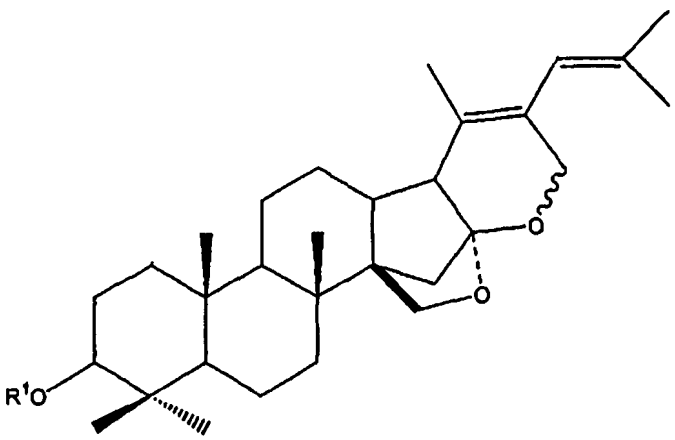
(I)

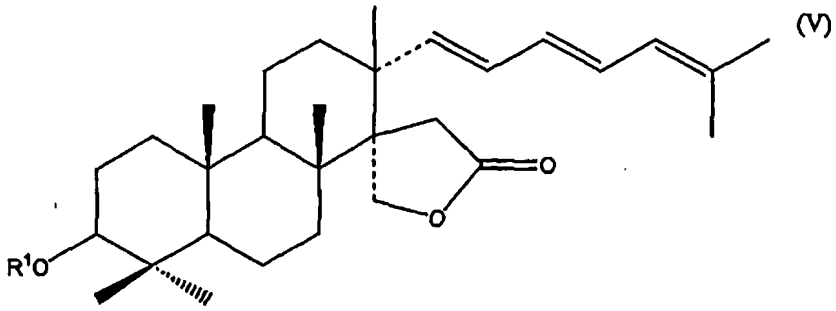


(II)



(III)





wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

87. The method of claim 86, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

88. The method of claim 86, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

89. The method of claim 86, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

90. The method of claim 86, wherein said compound has the general formula (IV) and R^1 is H.

91. The method of claim 86, wherein said compound has the general formula (V), R^1 is H.

92. The method of claim 84, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

93. The method of claim 84, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

94. The method of claim 84, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

95. The method of claim 94, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

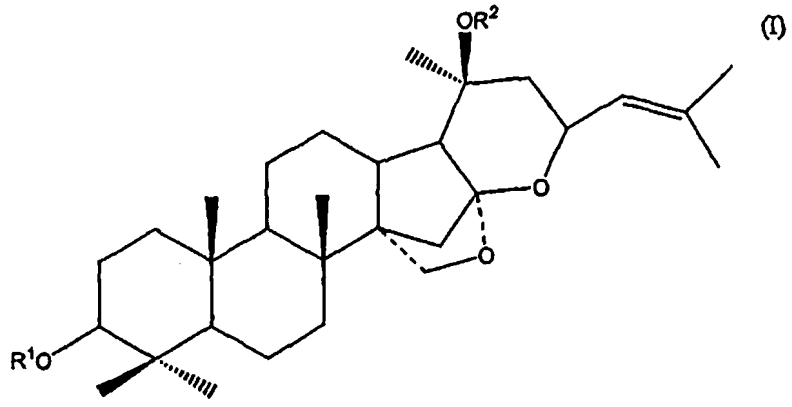
96. The method of claim 94, wherein said plant is *Bacopa monnieri* (Brahmi).

97. The method of claim 94, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

98. A method for preventing or otherwise inhibiting infection of a patient by a pathogenic organism, said method comprising administering to said patient an infection inhibiting effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent.

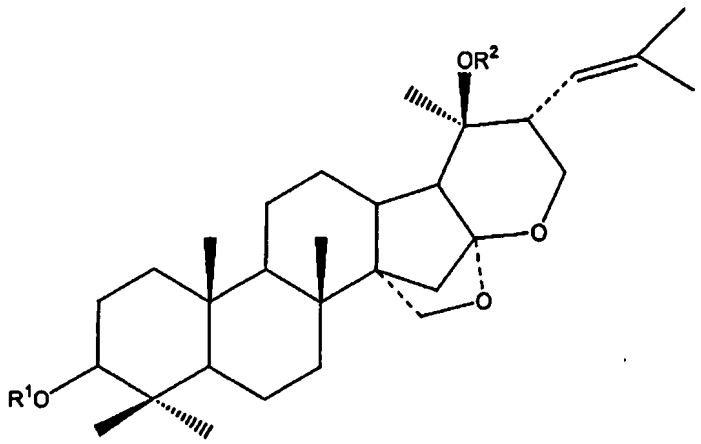
99. The method of claim 98, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

100. The method of claim 98, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:

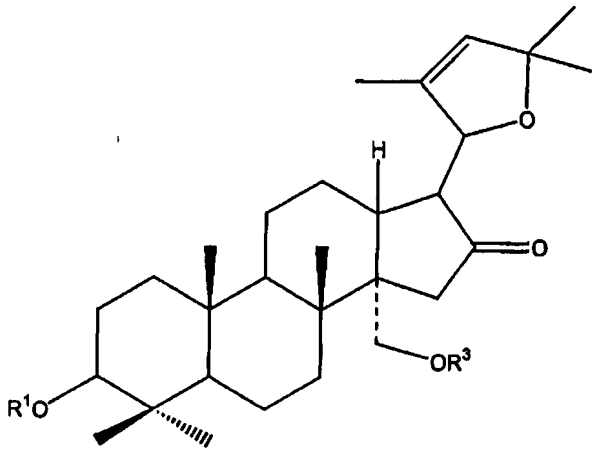


(I)

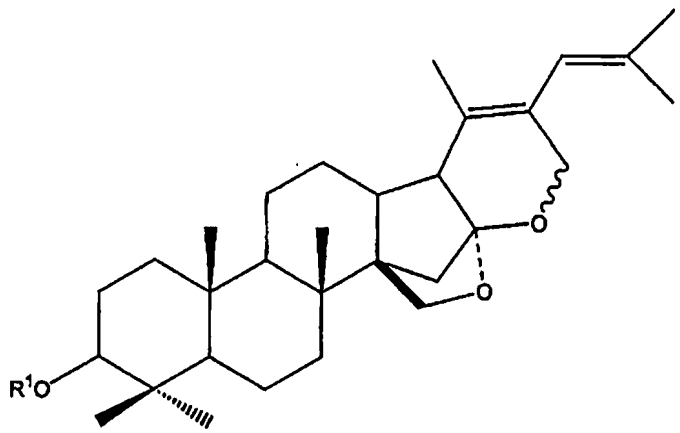
(II)



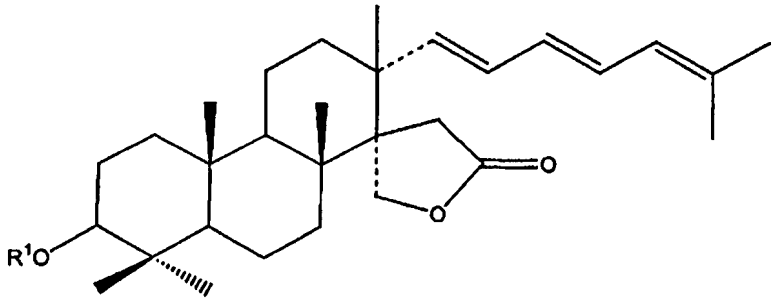
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

101. The method of claim 100, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

102. The method of claim 100, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

103. The method of claim 100, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

104. The method of claim 100, wherein said compound has the general formula (IV) and R^1 is H.

105. The method of claim 100, wherein said compound has the general formula (V), R^1 is H.

106. The method of claim 98, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

107. The method of claim 98, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

108. The method of claim 98, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

109. The method of claim 108, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

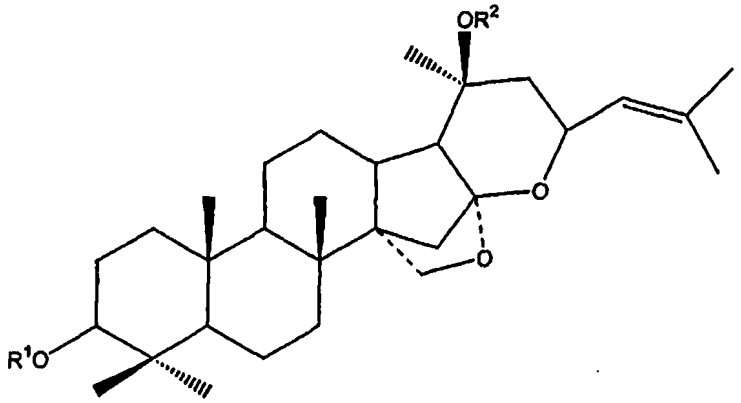
110. The method of claim 108, wherein said plant is *Bacopa monnieri* (Brahmi).

111. The method of claim 108, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

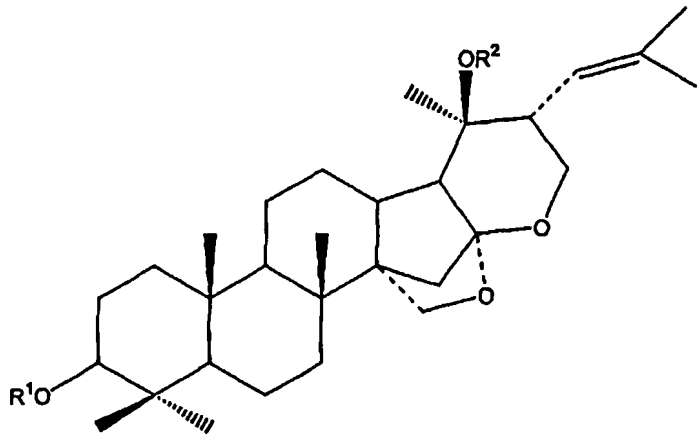
112. A method for preventing or otherwise inhibiting tumorigenesis in a patient, said method comprising administering to said patient a tumorigenesis inhibiting effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent.

113. The method of claim 112, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

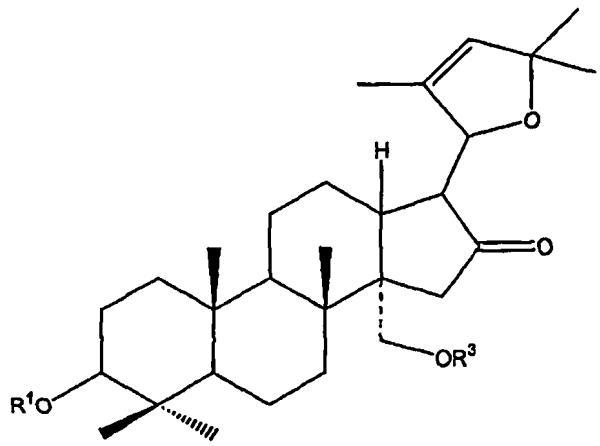
114. The method of claim 112, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



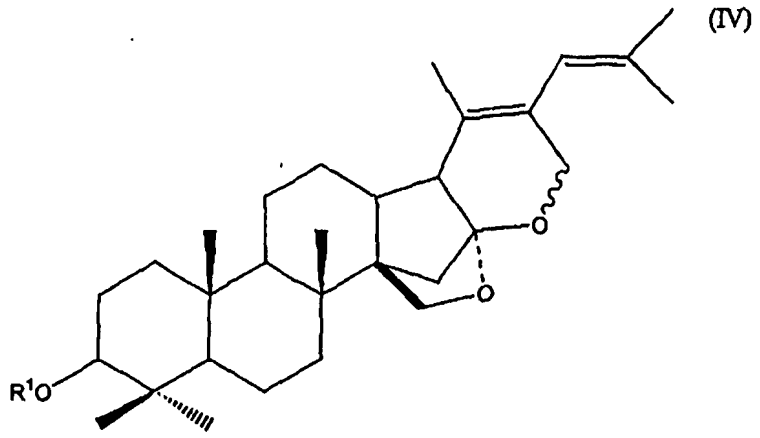
(I)



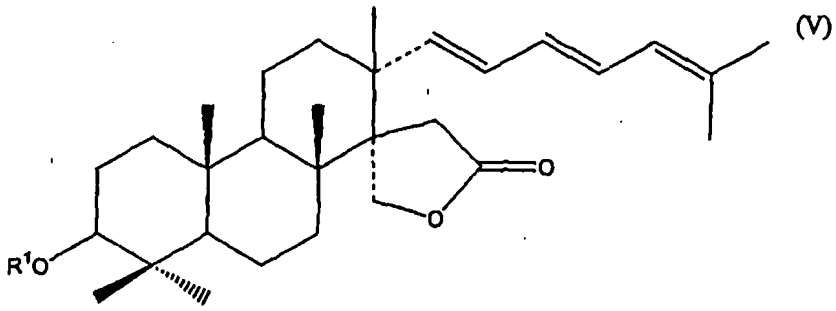
(II)



(III)



(IV)



(V)

wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

115. The method of claim 114, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

116. The method of claim 114, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

117. The method of claim 114, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

118. The method of claim 114, wherein said compound has the general formula (IV) and R^1 is H.

119. The method of claim 114, wherein said compound has the general formula (V), R^1 is H.

120. The method of claim 112, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

121. The method of claim 112, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

122. The method of claim 112, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

123. The method of claim 122, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

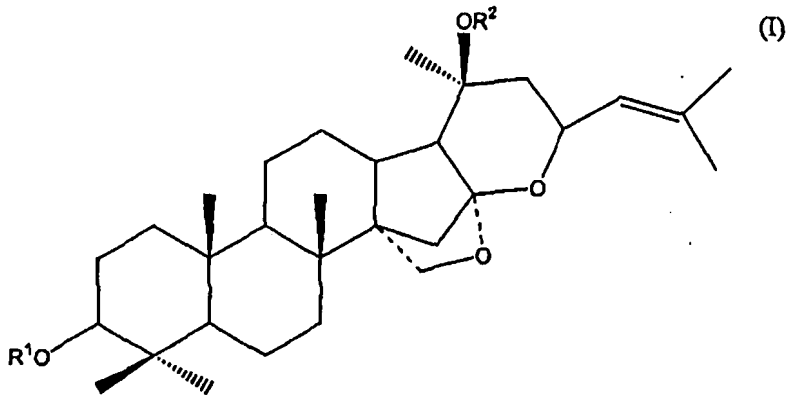
124. The method of claim 122, wherein said plant is *Bacopa monnieri* (Brahmi).

125. The method of claim 122, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

126. A method for enhancing the immune response of a patient against a cancer, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent sufficient to enhance the immune response against said cancer.

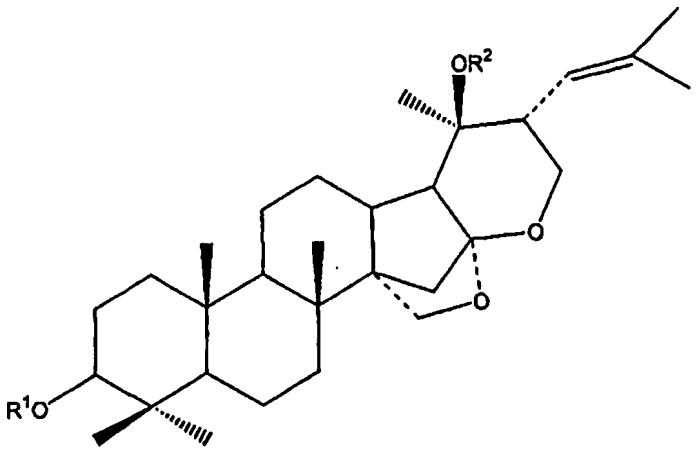
127. The method of claim 126, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

128. The method of claim 126, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:

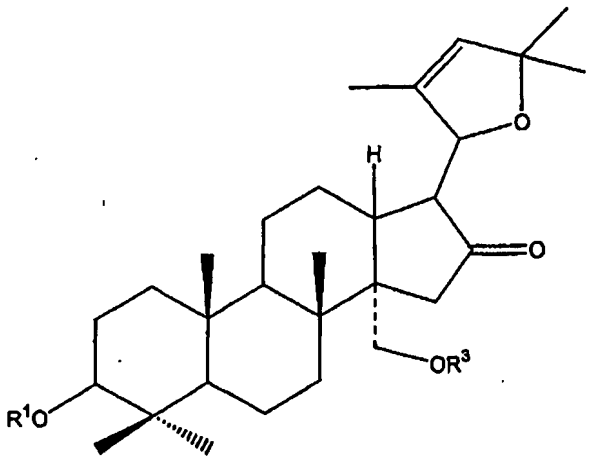


(I)

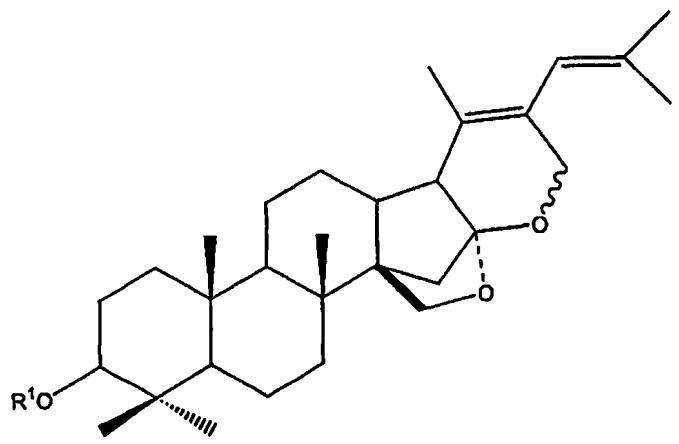
(II)



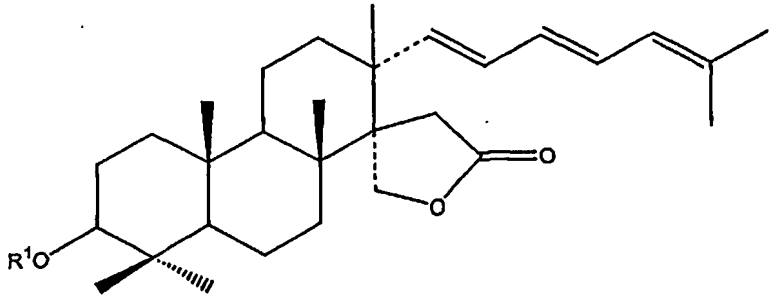
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

129. The method of claim 128, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

130. The method of claim 128, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

131. The method of claim 128, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

132. The method of claim 128, wherein said compound has the general formula (IV) and R^1 is H.

133. The method of claim 128, wherein said compound has the general formula (V), R^1 is H.

134. The method of claim 126, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

135. The method of claim 126, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

136. The method of claim 126, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

137. The method of claim 136, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

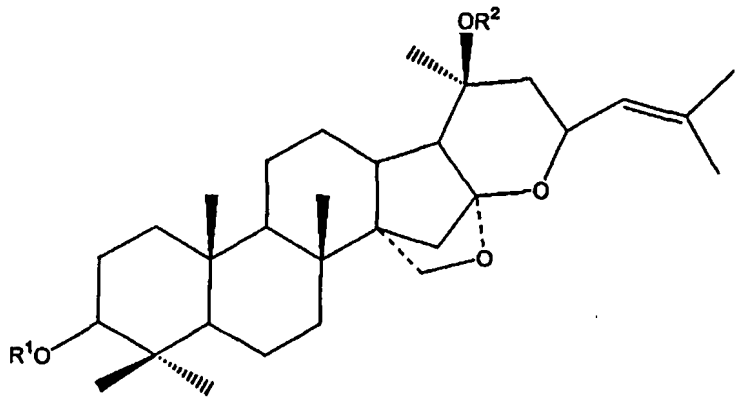
138. The method of claim 136, wherein said plant is *Bacopa monnieri* (Brahmi).

139. The method of claim 136, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

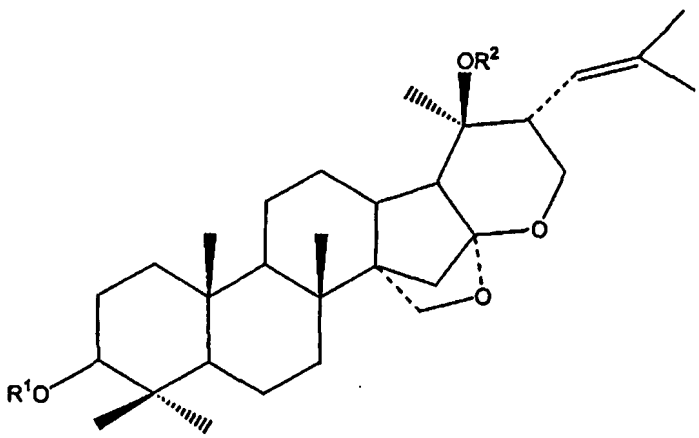
140. A method for reducing or otherwise inhibiting the rate of ageing of a patient, said method comprising administering to said patient an ageing-inhibiting effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent.

141. The method of claim 140, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

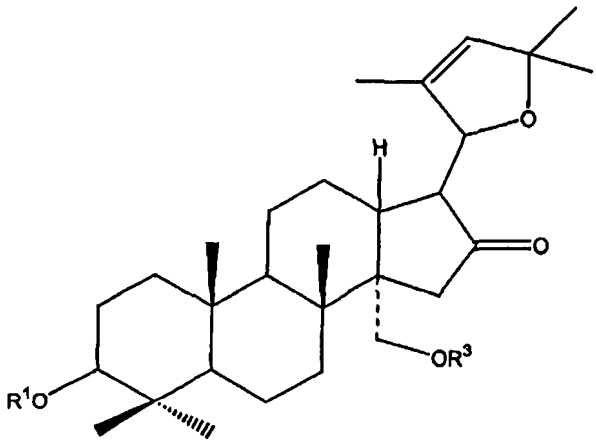
142. The method of claim 140, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



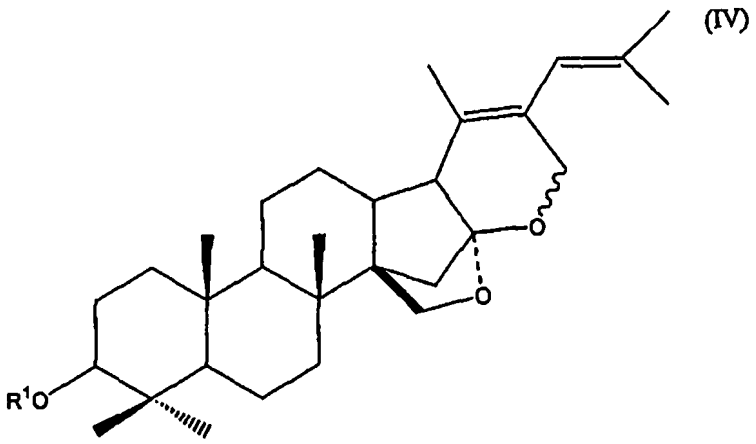
(I)

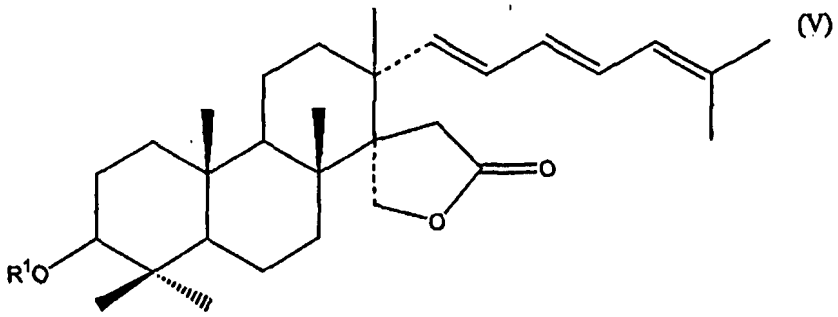


(II)



(III)





wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

143. The method of claim 142, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

144. The method of claim 142, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

145. The method of claim 142, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

146. The method of claim 142, wherein said compound has the general formula (IV) and R^1 is H.

147. The method of claim 142, wherein said compound has the general formula (V), R^1 is H.

148. The method of claim 140, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

149. The method of claim 140, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

150. The method of claim 140, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

151. The method of claim 150, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

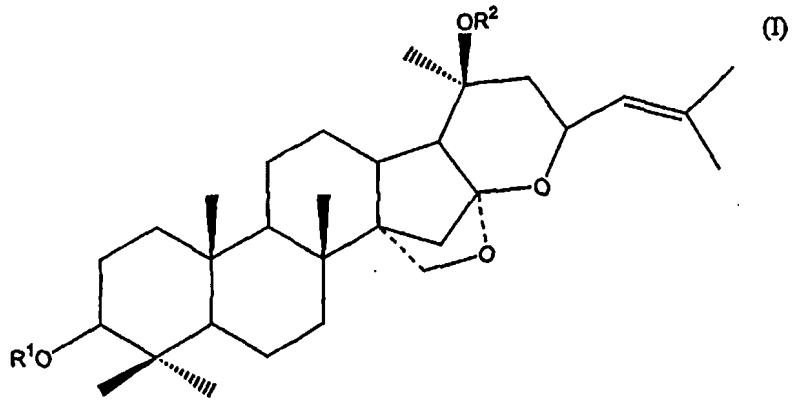
152. The method of claim 150, wherein said plant is *Bacopa monnieri* (Brahmi).

153. The method of claim 150, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

154. A method for increasing telomerase activity in a cell, said method comprising contacting said cell with a telomerase activity increasing effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent.

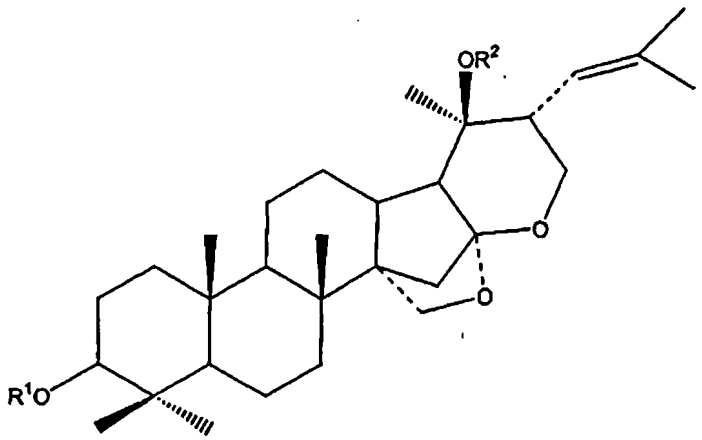
155. The method of claim 154, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

156. The method of claim 154, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:

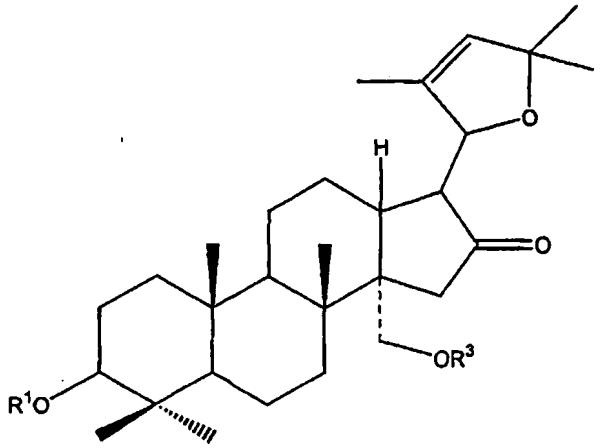


(I)

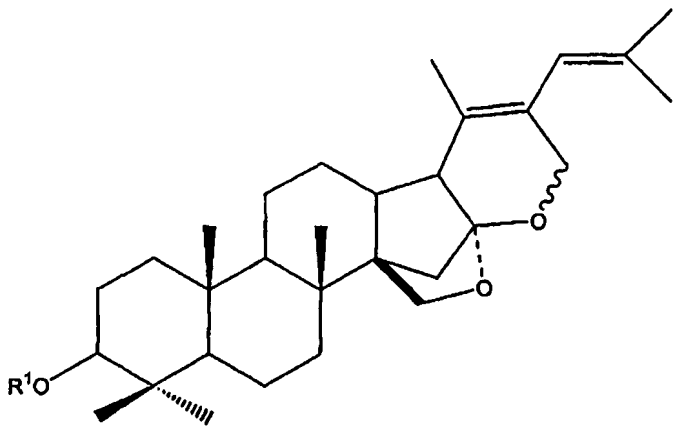
(II)



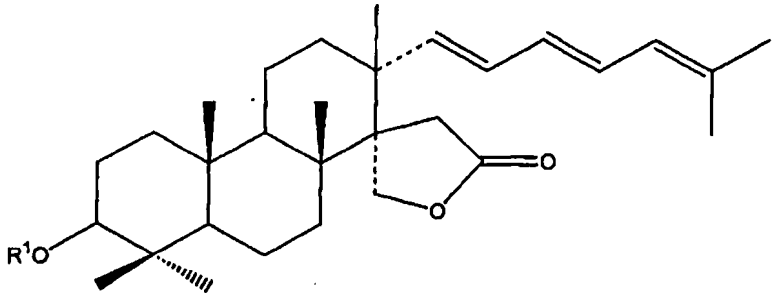
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

157. The method of claim 156, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

158. The method of claim 156, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

159. The method of claim 156, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

160. The method of claim 156, wherein said compound has the general formula (IV) and R^1 is H.

161. The method of claim 156, wherein said compound has the general formula (V), R^1 is H.

162. The method of claim 154, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

163. The method of claim 154, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

164. The method of claim 154, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

165. The method of claim 164, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

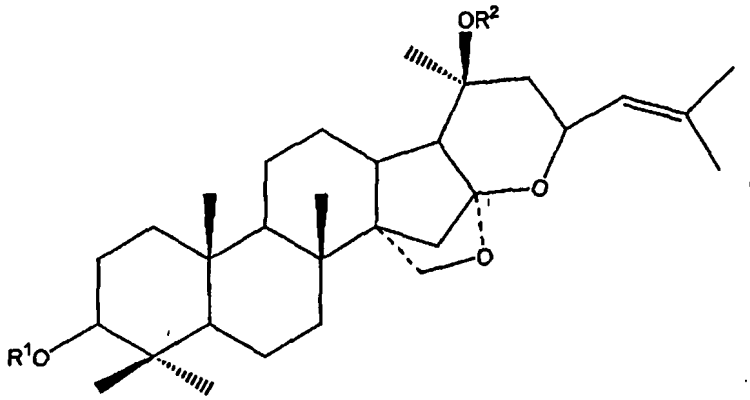
166. The method of claim 164, wherein said plant is *Bacopa monnieri* (Brahmi).

167. The method of claim 164, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

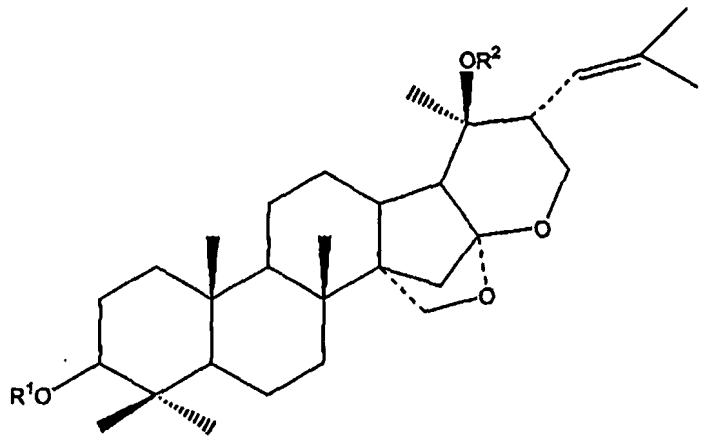
168. A method for improving the health or maintaining the well-being of a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier or diluent, sufficient to improve said health or to maintain said well-being.

169. The method of claim 168, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

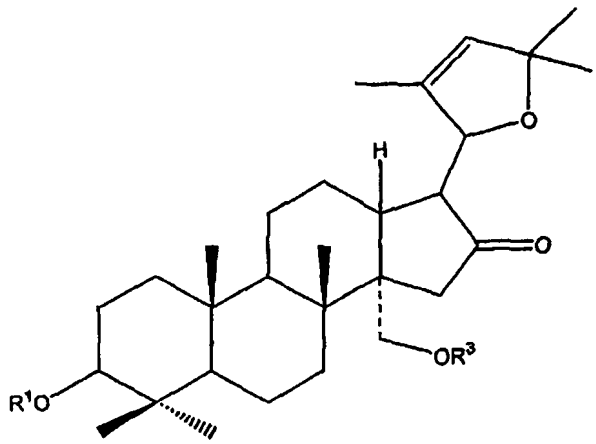
170. The method of claim 168, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



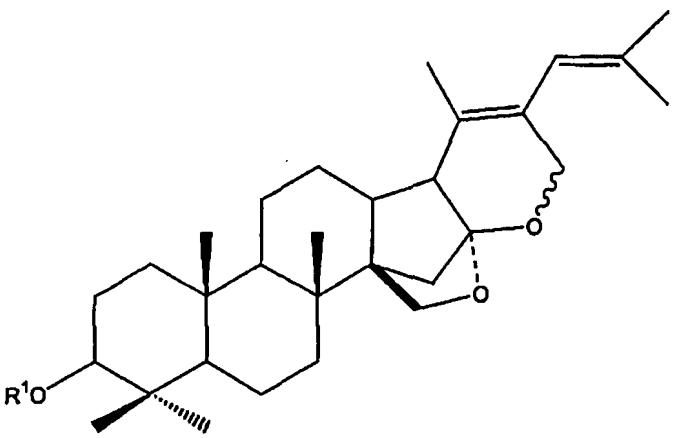
(I)

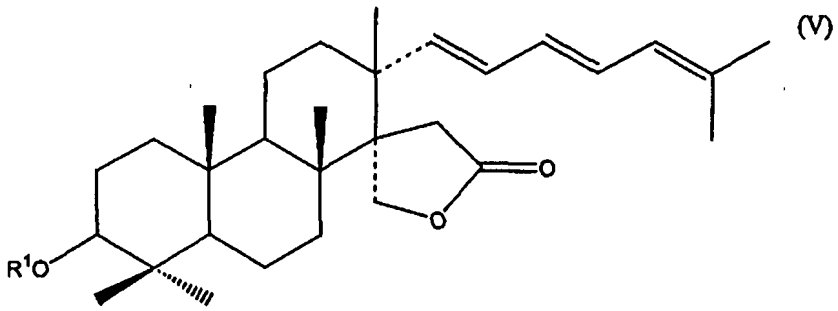


(II)



(III)





wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

171. The method of claim 170, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

172. The method of claim 170, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

173. The method of claim 170, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

174. The method of claim 170, wherein said compound has the general formula (IV) and R^1 is H.

175. The method of claim 170, wherein said compound has the general formula (V), R^1 is H.

176. The method of claim 168, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

177. The method of claim 168, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

178. The method of claim 168, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

179. The method of claim 178, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

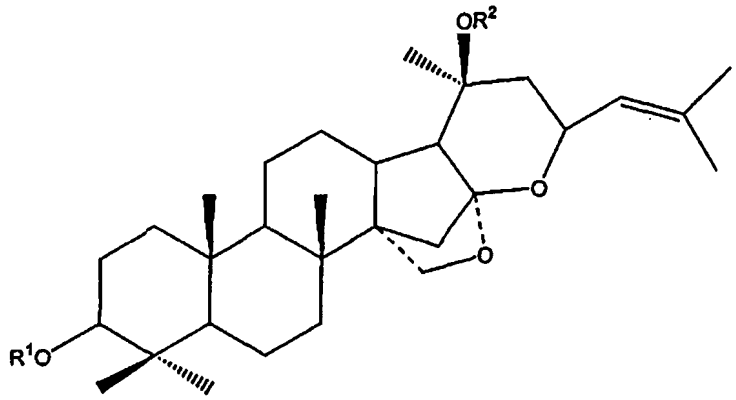
180. The method of claim 178, wherein said plant is *Bacopa monnieri* (Brahmi).

181. The method of claim 178, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

182. A method of enhancing lactation in a female patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier or diluent, sufficient to enhance lactation.

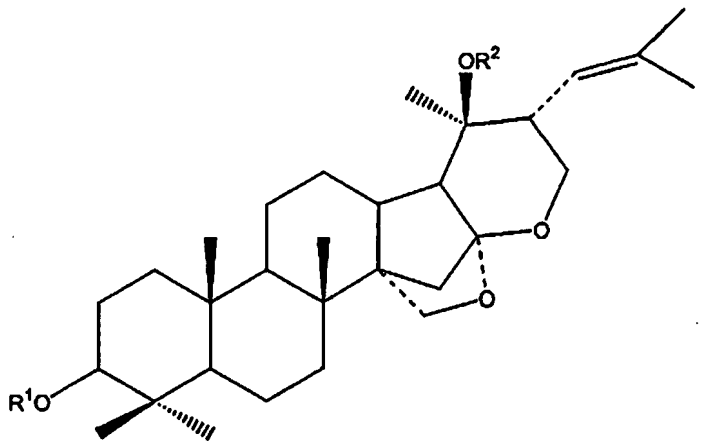
183. The method of claim 182, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

184. The method of claim 182, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:

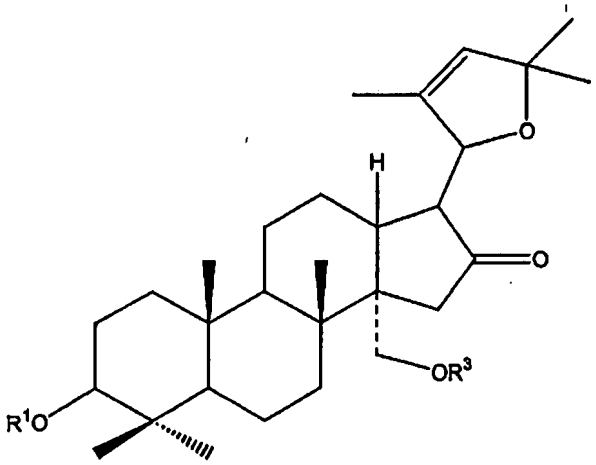


(I)

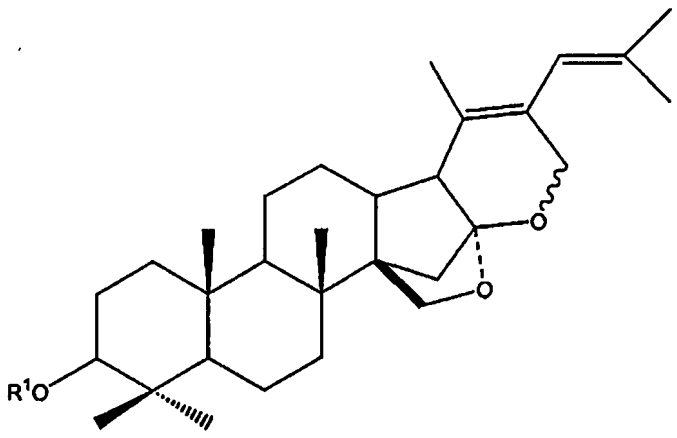
(II)



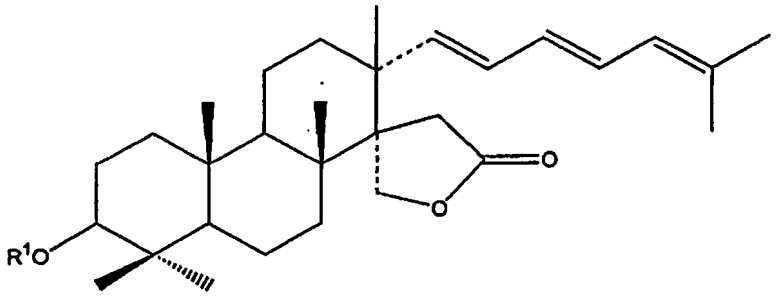
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

185. The method of claim 184, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

186. The method of claim 184, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

187. The method of claim 184, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

188. The method of claim 184, wherein said compound has the general formula (IV) and R^1 is H.

189. The method of claim 184, wherein said compound has the general formula (V), R^1 is H.

190. The method of claim 182, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

191. The method of claim 182, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

192. The method of claim 182, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

193. The method of claim 192, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

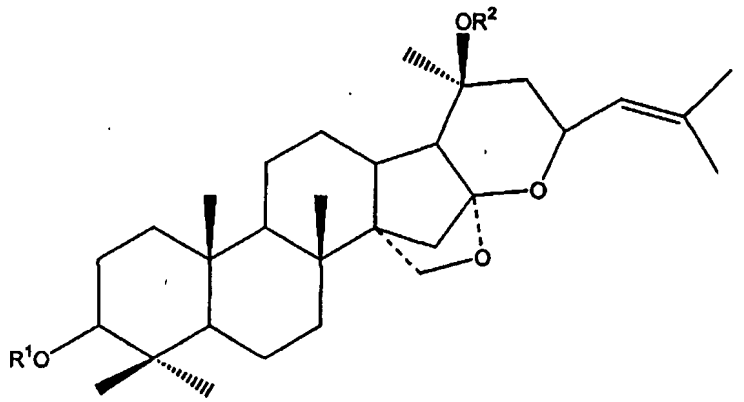
194. The method of claim 192, wherein said plant is *Bacopa monnieri* (Brahmi).

195. The method of claim 192, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

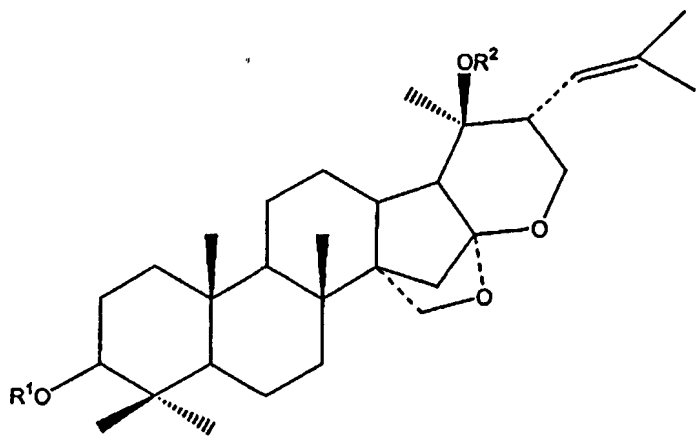
196. A method for enhancing bone formation in a patient, said method comprising administering to said patient an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier or diluent, sufficient to enhance said bone formation.

197. The method of claim 196, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

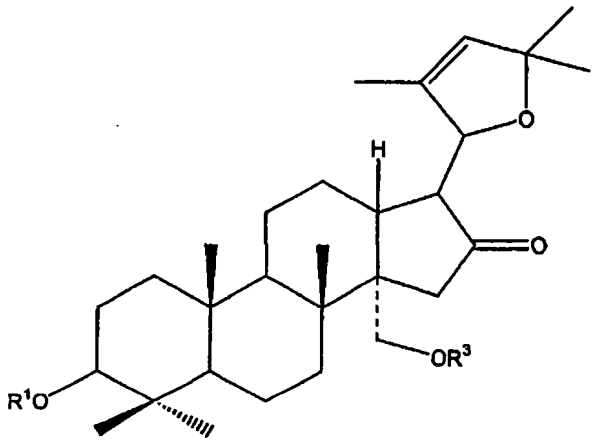
198. The method of claim 196, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



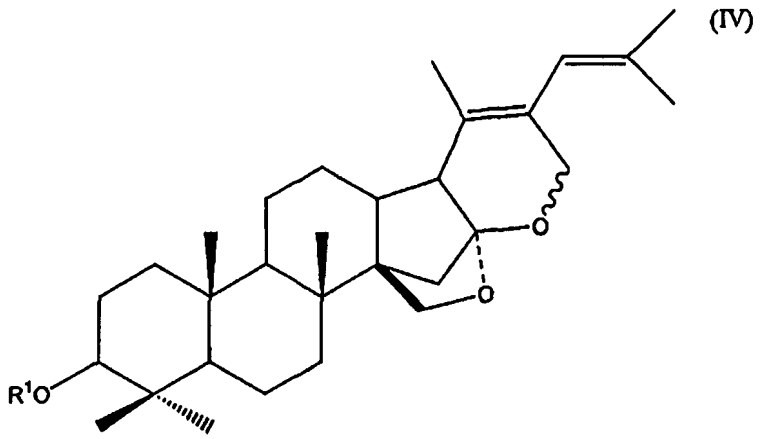
(I)



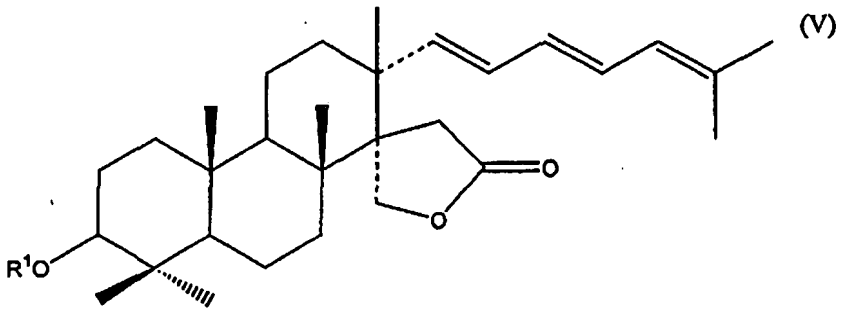
(II)



(III)



(IV)



(V)

wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

199. The method of claim 198, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

200. The method of claim 198, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

201. The method of claim 198, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

202. The method of claim 198, wherein said compound has the general formula (IV) and R^1 is H.

203. The method of claim 198, wherein said compound has the general formula (V), R^1 is H.

204. The method of claim 196, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

205. The method of claim 196, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

206. The method of claim 196, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

207. The method of claim 206, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

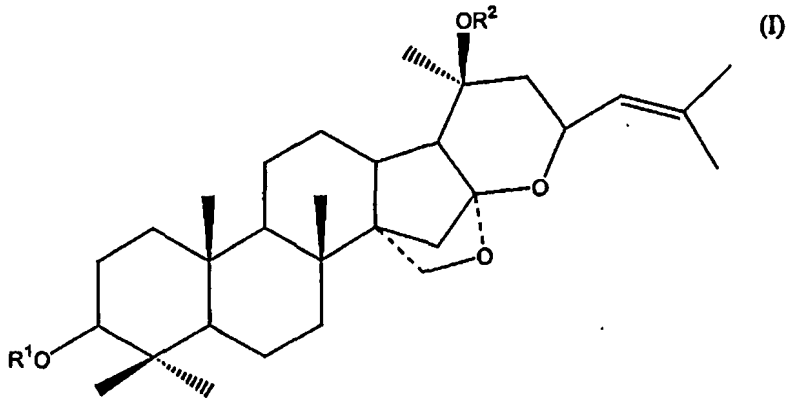
208. The method of claim 206, wherein said plant is *Bacopa monnieri* (Brahmi).

209. The method of claim 206, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

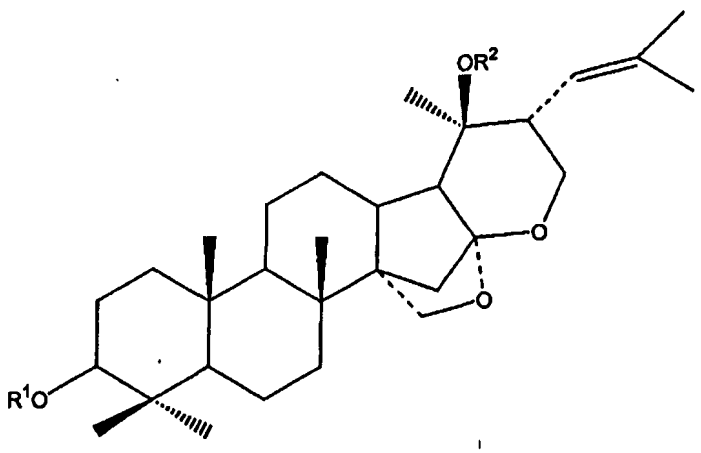
210. A method for reducing or otherwise inhibiting osteoclastic bone resorption, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to reduce said resorption.

211. The method of claim 210, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

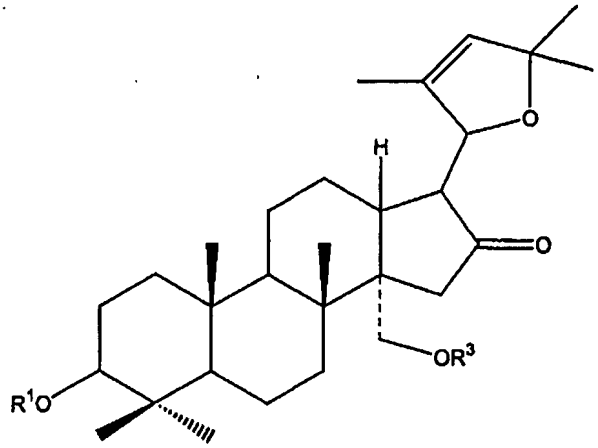
212. The method of claim 210, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



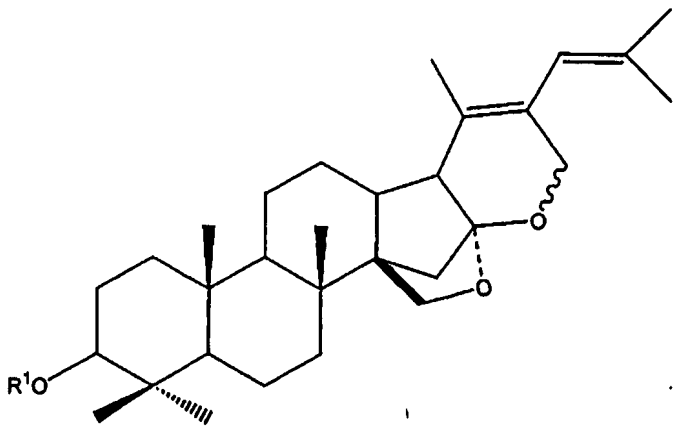
(II)



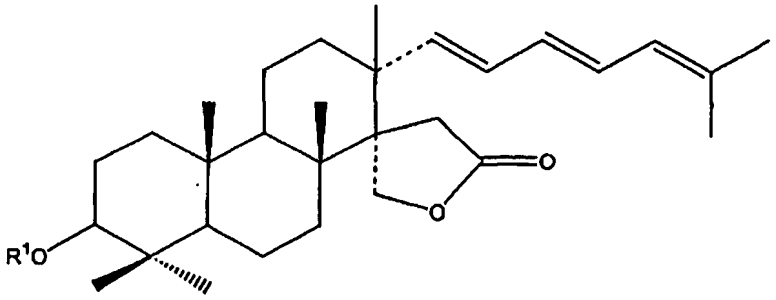
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

213. The method of claim 212, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

214. The method of claim 212, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

215. The method of claim 212, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

216. The method of claim 212, wherein said compound has the general formula (IV) and R^1 is H.

217. The method of claim 212, wherein said compound has the general formula (V), R^1 is H.

218. The method of claim 210, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

219. The method of claim 210, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

220. The method of claim 210, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

221. The method of claim 220, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

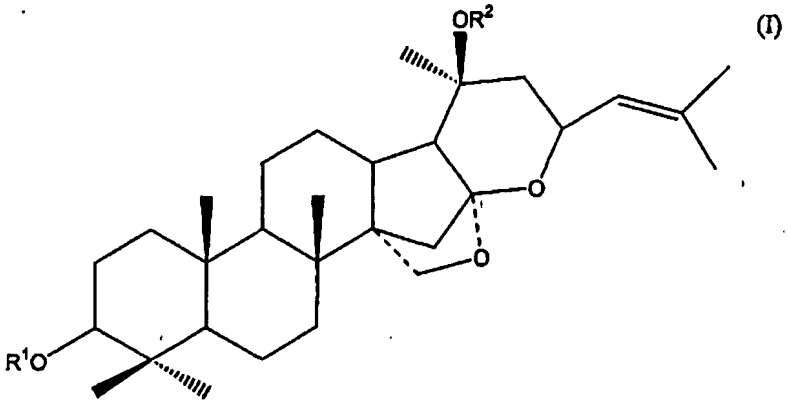
222. The method of claim 220, wherein said plant is *Bacopa monnieri* (Brahmi).

223. The method of claim 220, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

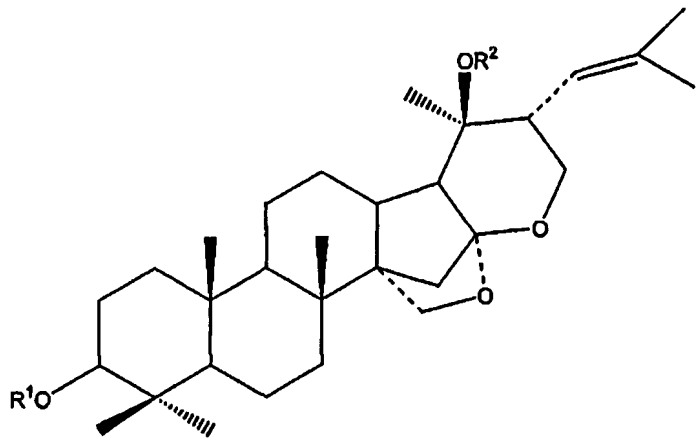
224. A method for enhancing the rate of wound healing, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance the rate of wound healing.

225. The method of claim 224, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

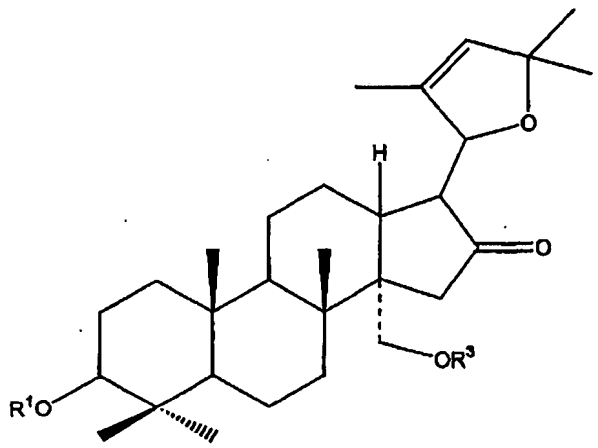
226. The method of claim 224, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



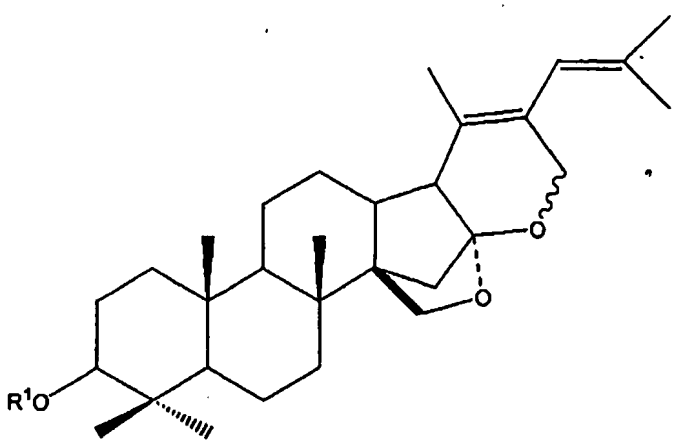
(I)

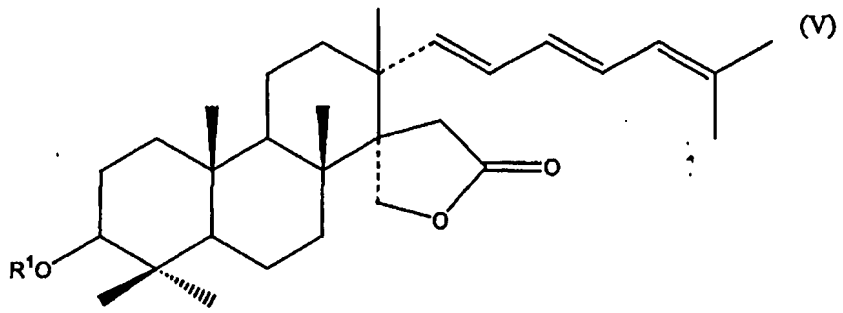


(II)



(III)





wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

227. The method of claim 226, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

228. The method of claim 226, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

229. The method of claim 226, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

230. The method of claim 226, wherein said compound has the general formula (IV) and R^1 is H.

231. The method of claim 226, wherein said compound has the general formula (V), R^1 is H.

232. The method of claim 224, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

233. The method of claim 224, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

234. The method of claim 224, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

235. The method of claim 234, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

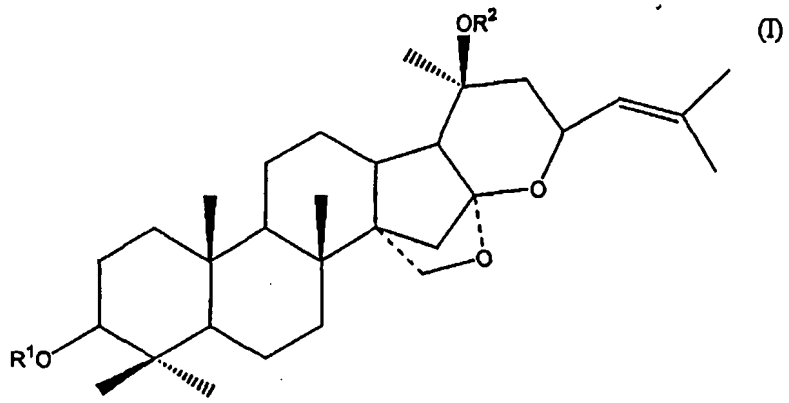
236. The method of claim 234, wherein said plant is *Bacopa monnieri* (Brahmi).

237. The method of claim 234, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

238. A method for improving male fertility, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to improve said fertility.

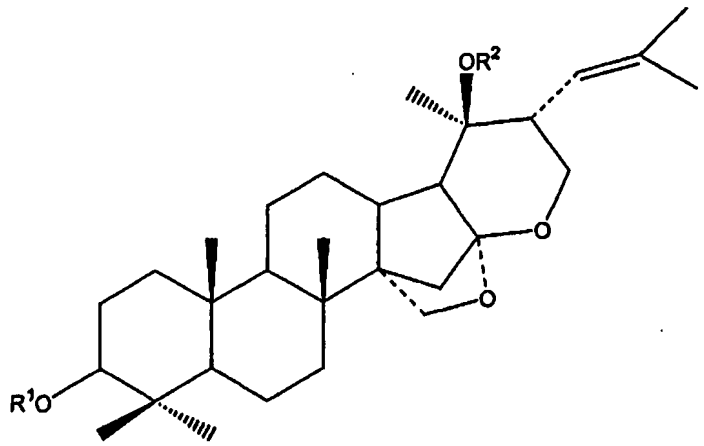
239. The method of claim 238, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

240. The method of claim 238, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:

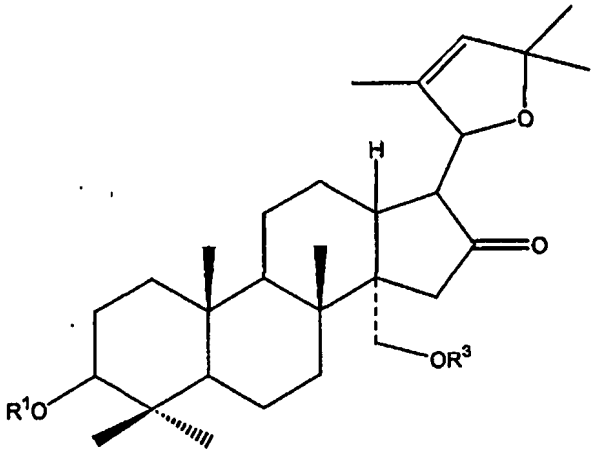


(I)

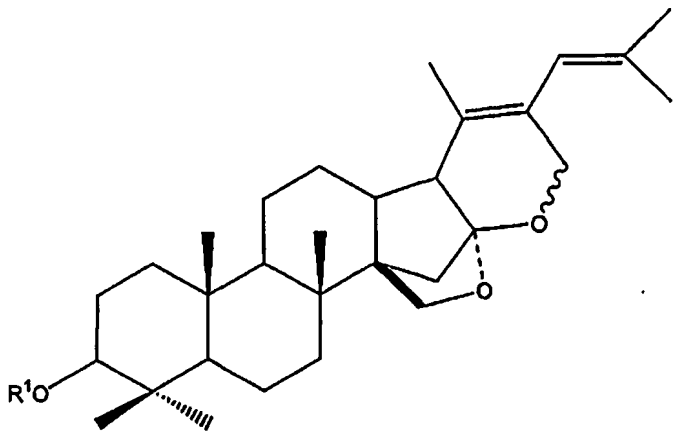
(II)



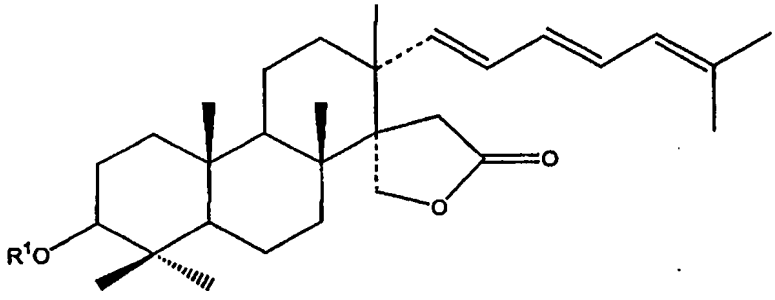
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

241. The method of claim 240, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

242. The method of claim 240, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

243. The method of claim 240, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

244. The method of claim 240, wherein said compound has the general formula (IV) and R^1 is H.

245. The method of claim 240, wherein said compound has the general formula (V), R^1 is H.

246. The method of claim 238, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

247. The method of claim 238, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

248. The method of claim 238, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

249. The method of claim 248, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

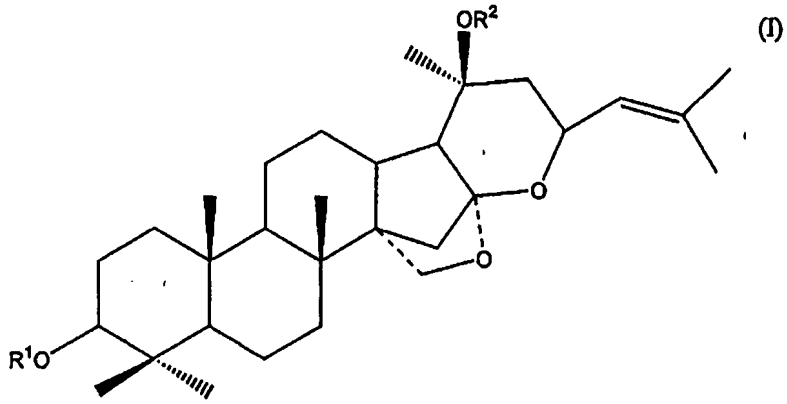
250. The method of claim 248, wherein said plant is *Bacopa monnieri* (Brahmi).

251. The method of claim 248, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

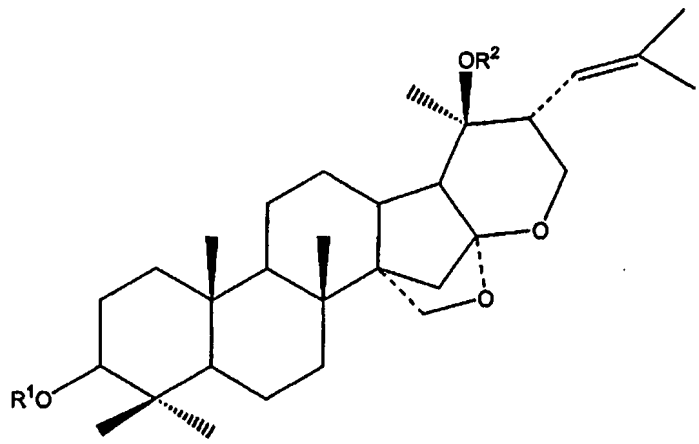
252. A method for improving female fertility, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to improve said fertility.

253. The method of claim 252, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

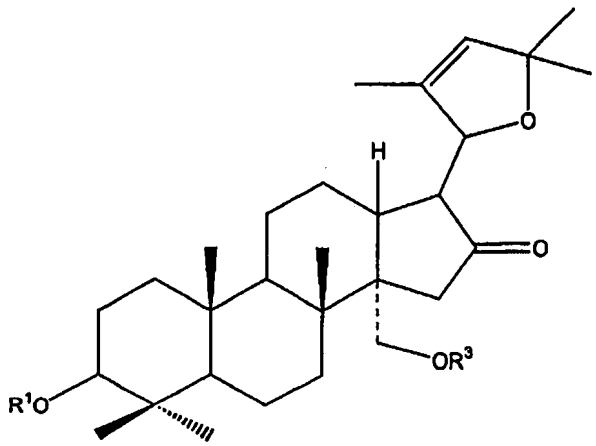
254. The method of claim 252, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



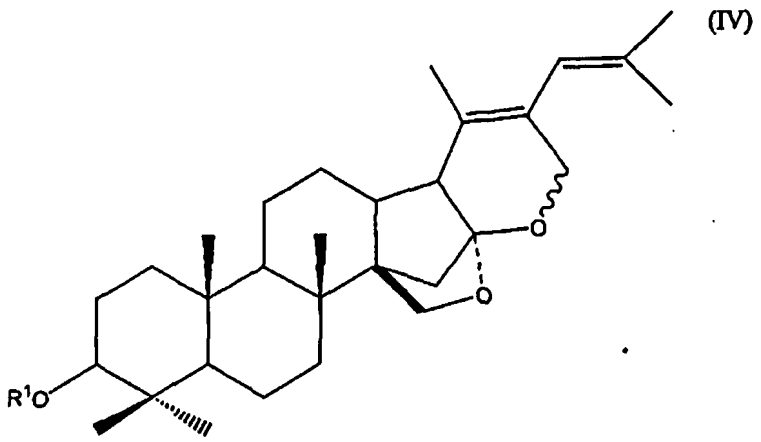
(I)

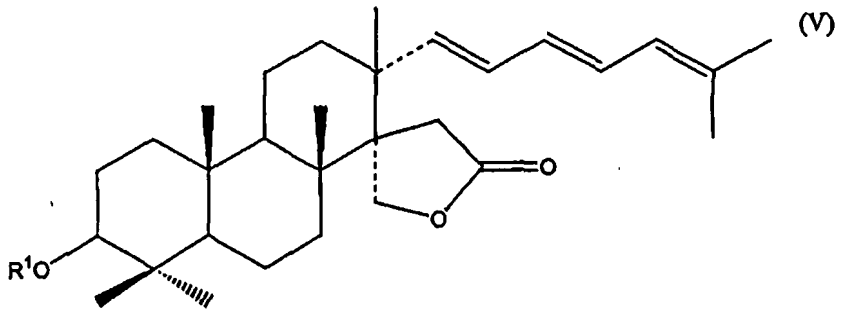


(II)



(III)





wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

255. The method of claim 254, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

256. The method of claim 254, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

257. The method of claim 254, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

258. The method of claim 254, wherein said compound has the general formula (IV) and R^1 is H.

259. The method of claim 254, wherein said compound has the general formula (V), R^1 is H.

260. The method of claim 252, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

261. The method of claim 252, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

262. The method of claim 252, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

263. The method of claim 262, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

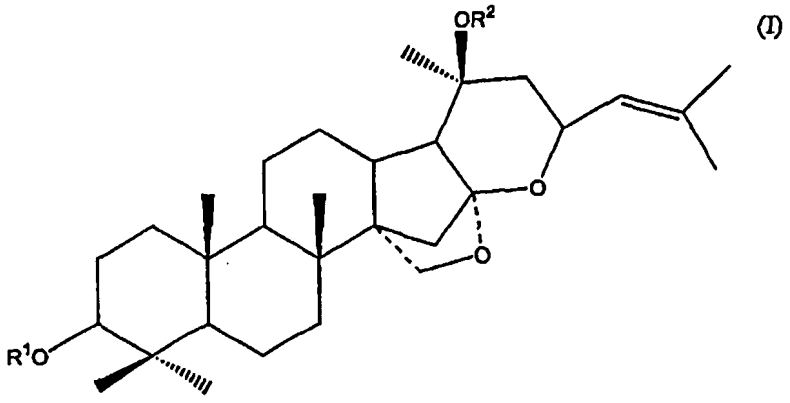
264. The method of claim 262, wherein said plant is *Bacopa monnieri* (Brahmi).

265. The method of claim 262, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

266. A method for enhancing hepatic cytoprotection or ameliorating liver damage, said method comprising administering to a patient in need of such treatment an effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to enhance said cytoprotection or to ameliorate said damage.

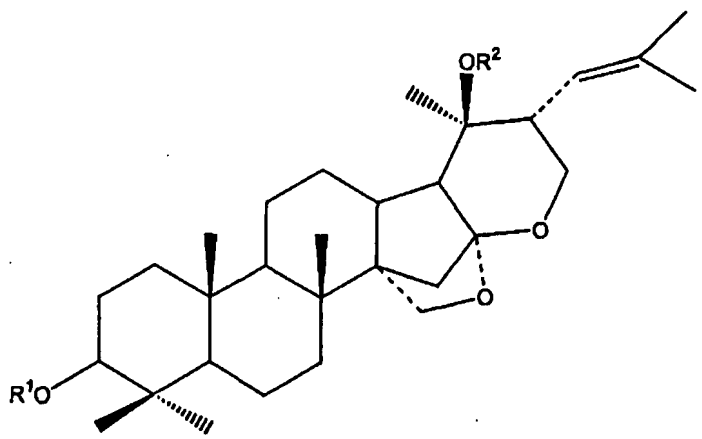
267. The method of claim 266, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

268. The method of claim 266, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:

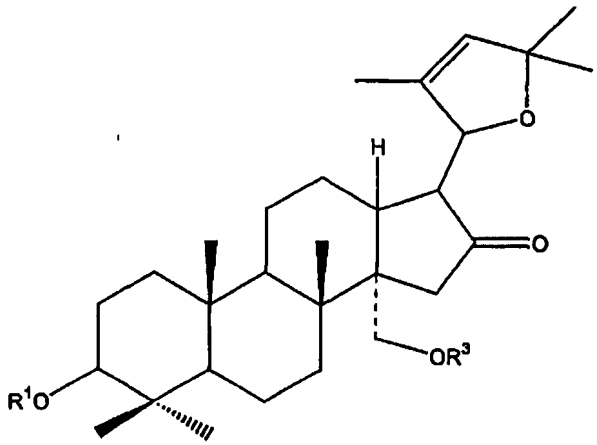


(I)

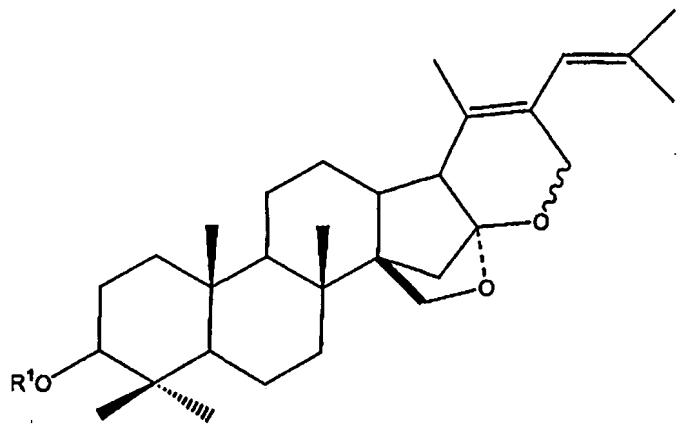
(II)



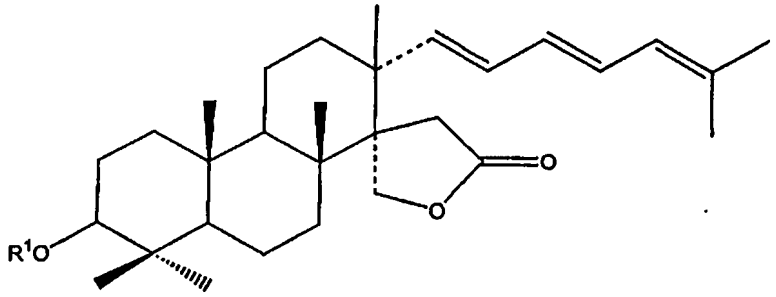
(III)



(IV)



(V)



wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

269. The method of claim 268, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

270. The method of claim 268, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

271. The method of claim 268, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

272. The method of claim 268, wherein said compound has the general formula (IV) and R^1 is H.

273. The method of claim 268, wherein said compound has the general formula (V), R^1 is H.

274. The method of claim 266, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

275. The method of claim 266, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

276. The method of claim 266, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

277. The method of claim 276, wherein said plant is selected from *Bacopa caroliniana*, *Bacopa egensis*, *Bacopa eisenii*, *Bacopa innominata*, *Bacopa monnieri*, *Bacopa procumbens*, *Bacopa repens*, *Bacopa rotundifolia* and *Bacopa stricta*.

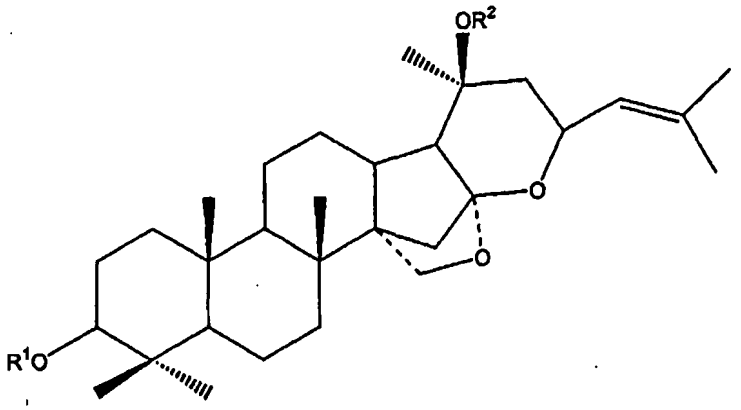
278. The method of claim 276, wherein said plant is *Bacopa monnieri* (Brahmi).

279. The method of claim 276, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

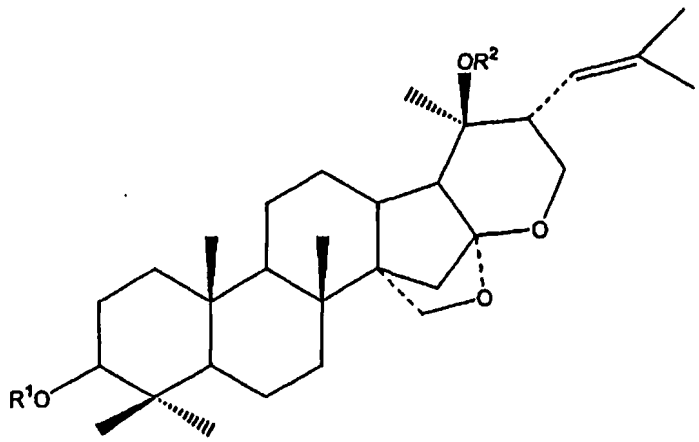
280. A method of improving the quality of human breast milk animal, comprising administering to a subject before or during lactation a milk quality improving effective amount of a compound selected from a dammarane-type triterpenoid saponin or derivative or pharmaceutically acceptable salt thereof or combination of these, and optionally a pharmaceutically acceptable carrier and/or diluent, sufficient to improve said quality.

281. The method of claim 280, wherein said dammarane-type triterpenoid saponin is a pseudojujubogenin glycoside.

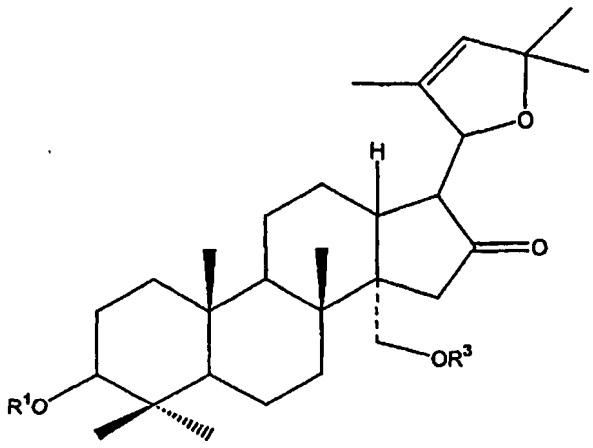
282. The method of claim 280, wherein said dammarane-type triterpenoid saponin is a compound represented by a general formula selected from the group of consisting of:



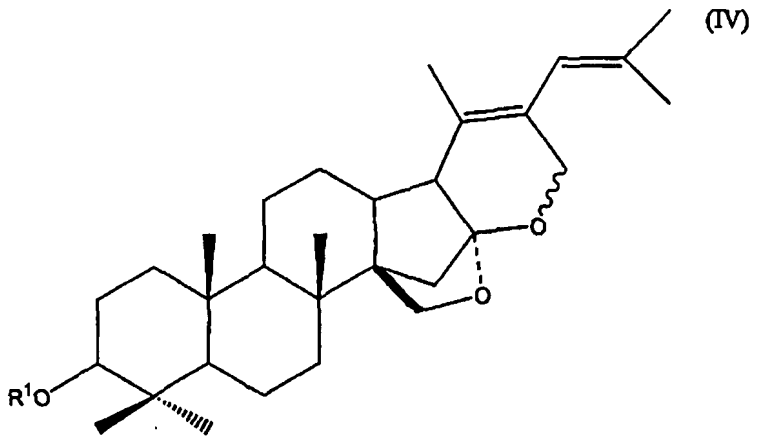
(I)

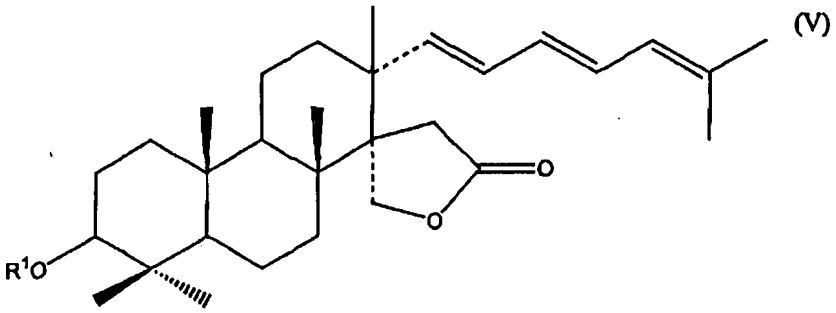


(II)



(III)





wherein:

R^1 and R^3 are individually and independently selected from H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl, isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably selected from β-D-glucopyranosyl, β-L-glucopyranosyl, α-L-arabinopyranosyl, and α-L-arabinofuranosyl; and

R^2 is H or any other cation, preferably a metallic cation, more preferably an alkaline metallic cation (such as K^+, Na^+ and the like) or alkaline earth metallic cation (such as Mg^{2+}, Ca^{2+} and the like), lower alkyl including linear and branched alkyl (such as methyl, ethyl, propyl, isopropyl, isobutyl, isopentyl and the like), lower alkene including linear or branched alkenes (such as vinyl, propenyl, isopropenyl, n-butenyl, isobutenyl,

isopentenyl, allyl and the like), lower alkanoyl (such as acetyl, propionyl and butyryl), benzyl, a carbohydrate moiety comprising at least one carbohydrate monomer, modified or unmodified, branched or unbranched, the carbohydrate moiety preferably comprising five membered ring structures, six membered ring structures or both, the carbohydrate monomer preferably comprising α-L-arabinopyranosyl.

283. The method of claim 282, wherein said compound has the general formula (I), R^1 is 3-O-α-L-arabinopyranosyl and R^2 is 20-O-α-L-arabinopyranosyl.

284. The method of claim 282, wherein said compound has the general formula (II), R^1 is selected from the group consisting of 3-O-[α-L-arabinopyranosyl (1-2) α-arabinopyranosyl], 3-O-[β-D-glucopyranosyl (1-3) {α-L-arabinofuranosyl (1-2)} α-L-arabinopyranosyl] and 3-O-[α-L-arabinofuranosyl (1-2) β-D-glucopyranosyl] pseudojujubogenin and R^2 is H.

285. The method of claim 282, wherein said compound has the general formula (III), R^1 is H and R^3 is H.

286. The method of claim 282, wherein said compound has the general formula (IV) and R^1 is H.

287. The method of claim 282, wherein said compound has the general formula (V), R^1 is H.

288. The method of claim 280, wherein said dammarane-type triterpenoid saponin is a bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

289. The method of claim 280, wherein said derivative is selected from ethoxylate derivatives, propoxylate derivatives, hydrates, aldehyde derivatives, ester derivatives, ether derivatives, alcohol derivatives, phenol derivatives, amine derivatives, other biologically or chemically equivalent substances, or any combination of two or more of the foregoing.

290. The method of claim 280, wherein said compound is in the form of a chemical fraction derived from a plant of the genus *Bacopa*.

291. The method of claim 290, wherein said plant is selected from *Bacopa caroliniana, Bacopa egensis, Bacopa eisenii, Bacopa innominata, Bacopa monnieri, Bacopa procumbens, Bacopa repens, Bacopa rotundifolia* and *Bacopa stricta.*

292. The method of claim 290, wherein said plant is *Bacopa monnieri* (Brahmi).

293. The method of claim 290, wherein said chemical fraction comprises at least one bacopasaponin selected from bacopasaponin A, bacopasaponin B, bacopasaponin C, bacopasaponin D, bacopasaponin E, bacopasaponin F, or analogue or derivative thereof.

294. The method of claim 280, wherein said improvement in the milk relates to an increase in the protein content of said milk.

295. The method of claim 280, wherein said improvement in the milk relates to an increase in the vitamin content of said milk, wherein the vitamin is selected from Vitamins A, D or E or combination of these.

296. The method of claim 280, wherein said vitamin is selected from Vitamins A or D.

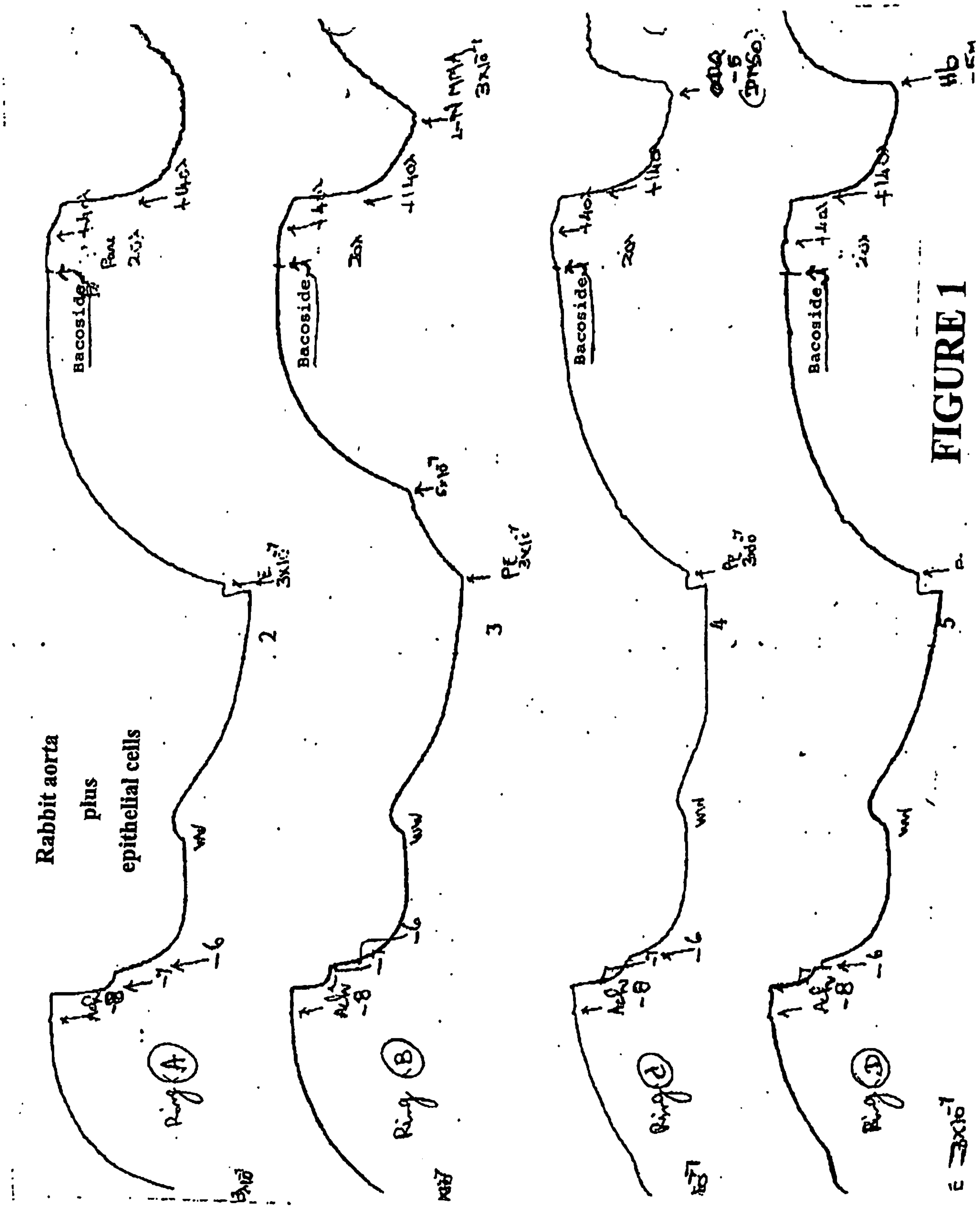

Rabbit aorta
plus
epithelial cells
Bacoside
Bacoside
Bacoside
Bacoside
Ring A
Ring B
Ring C
Ring D
2
3
4
5

FIGURE 1

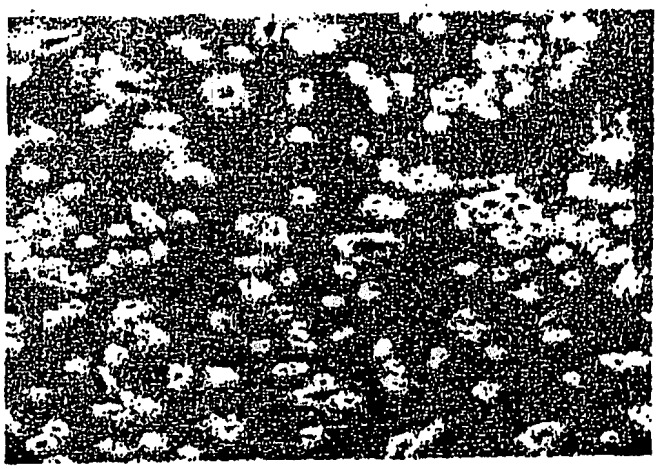


FIGURE 2

FIGURE 3

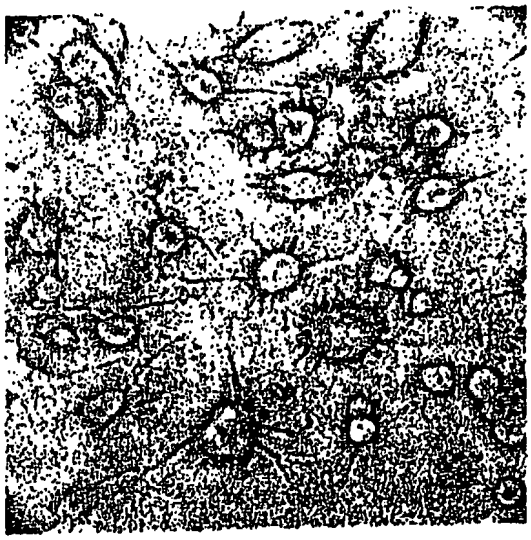


FIGURE 4

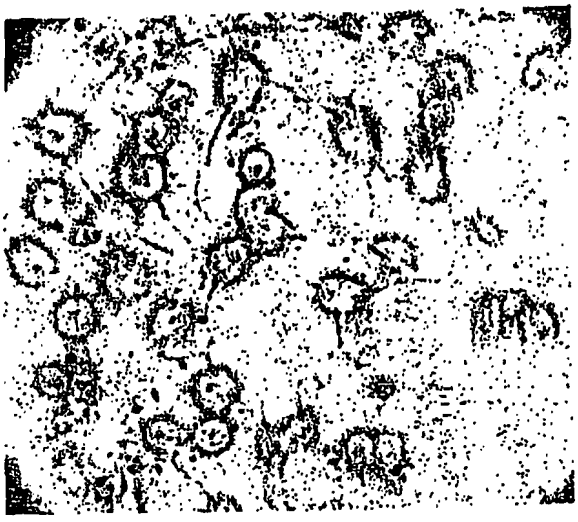


FIGURE 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU01/00837

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. [7]: A61K 31/58, 31/7048, A61P 9/08, 21/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

REFER ELECTRONIC DATA BASE CONSULTED BELOW

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI, CAPLUS, MEDLINE & keywords: bacopa, brahmi, dammarane, jujubogenin, nitric oxide

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Gillis CN, *Panax ginseng* pharmacology: a nitric oxide link? *Biochem Pharmacol*, 1 July 1997, 54(1),1-8 Abstract, article	1-296
X	Dar A *et al.*, Calcium antagonistic activity of *Bacopa monniera* on vascular and intestinal smooth muscles of rabbit and guinea-pig *J Ethnopharmacol*, August 1999, 66(2), 167-174 Abstract,article	1-296
X	WO0013696A (PANDITA) 16 March 2000 Pages 1-3, claim 1	70-97, 168-181

[X] Further documents are listed in the continuation of Box C [X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 August 2001	21 August 2001
Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	TERRY SUMMERS Telephone No : (02) 6283 3126

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU01/00837

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO9940897A (SEDERMA SA) 19 August 1999 Page 1 line 32-page 2 line3, claims 10-11	70-97, 112-125, 126-153, 168-181
X	WO9829089A (SINGH-VERMA) 9 July 1998 (&US6261605B1) Column 2	98-111, 168-181, 224-237
X	Patent abstracts of Japan, JP3058939A (TOREEDE UINDO KK) 14 March 1991 Abstract	140-153, 168-181
X	Derwent abstract accession no. 84-292015, Class B01, JP59-181217A (ROHTO PHARMACEUTICAL KK) 15 October 1984 Title, abstract	112-139, 167-181
X	Derwent abstract accession no. 96-283415, Class B05, JP08-119866A (NEOS KK) 14 May 1996 Title, abstract	112-139, 167-181
X	Derwent abstract accession no. 88-158420, Class B01, JP63-099094A (ROHTO PHARMACEUTICAL KK) 30 April 1988 Title, abstract	112-139, 167-181
X	Derwent abstract accession no. 97-203981, Class B01, CN1097194A (KUNMING MEDICAL INST) 11 January 1995 Title, abstract	112-139, 167-181
X	FR2398078A (SALOME) 16 February 1979 Entire document	70-97, 168-181
O,X	Dr Marios Kyriazis' directory of anti-aging drugs, supplements and ageceuticals, British Longevity Society, [retrieved on 14 August 2001] Retrieved from the Internet <URL://www.antiageing.freeserve.co.uk/drugs.htm Entry: Bacopa monnieri (Brahmi plant)	1-296
O,X	Block Will, Revitalize your intellect, *Life Enhancement Magazine*, March 2000, [retrieved on 15 August 2001] Retrieved from the Internet <URL:http://www.life-enhancement.com/displayart.asp?ID=147 Entire article, especially, Heading "Nobel prize winner and heads of state" and reference 13	1-296
O,X	Herbal Spotlight -Bocopa Monniera: learning and memory enhancement with Ayurveda, *Ayurvedic News*, Issue No. 4, Sep/Oct1997 [retrieved on 15 August 2001] Retrieved from the Internet <URLhttp://www.ayurvedicscience.com/ayurvedic-news/backissues/sepoct97.htm Entire article	70-139, 168-181

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU01/00837

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
WO	200013696	AU	54425/99	EP	1039919		
WO	9940897	AU	22836/99	FR	2774590		
WO	9829089	AU	58574/98	EP	892635	US	6261605
FR	2398078	NONE					

END OF ANNEX